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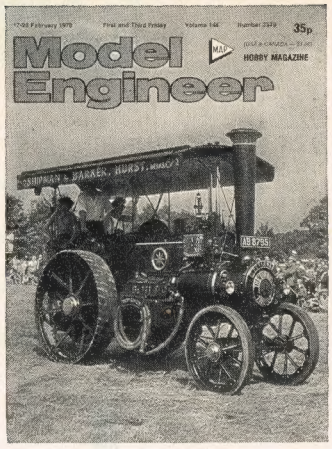

1913 Burrell Traction Engine "Defiance". Photo by I. J. Belcher.

NEXT ISSUE

A locomotive building stand.

The Editor is pleased to consider contributions for publication in "Model Engineer". Manuscripts should be accompanied if possible by illustrations and should also have a stamped addressed envelope for their return if unsuitable. While every care is taken, no responsibility can be accepted for unsolicited manuscripts, photographs, art work, etc.

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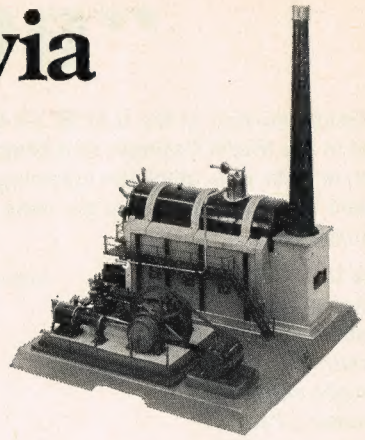
M.E. QUERY COUPON FEBRUARY 1978

Sotheby's Belgravia

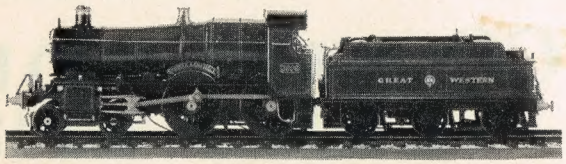
Sale by auction
Friday 3rd March at 11am and 2.30pm

COLLECTORS' ITEMS

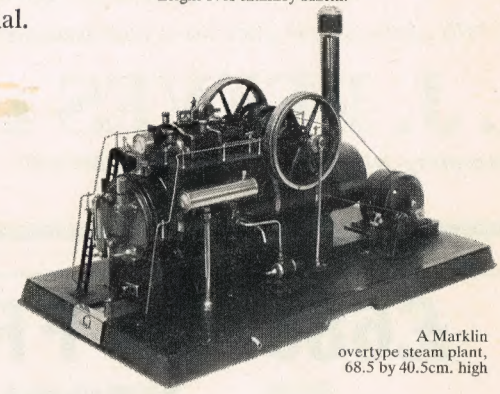
including commercially-built models by Bing, Marklin, Bassett-Lowke, Hornby and others; Engineered models of Traction Engines up to 3 inch scale and Locomotives up to 5 inch gauge; Railwayana; and a large quantity of Meccano material.



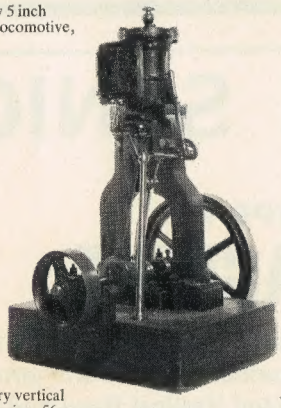
A massive Marklin steam plant, spirit fired, twin cylinder engine, base 91.5cm, height over chimney 112cm.



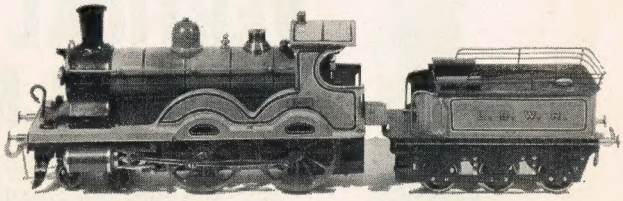
Exhibition quality 5 inch gauge live steam locomotive, 160cm.



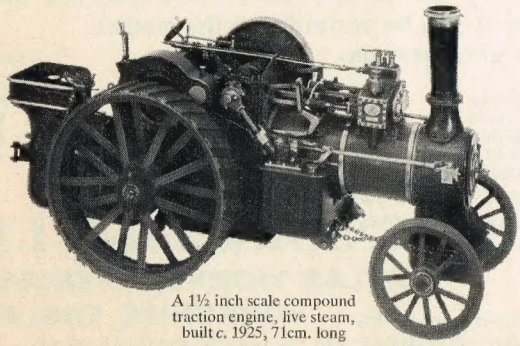
A Marklin overtype steam plant, 68.5 by 40.5cm. high



A rare 19th century vertical reversing steam engine, 56cm.



Bing gauge 'Three' spirit fired locomotive, *c.* 1905, 63.5cm.



A 1½ inch scale compound traction engine, live steam, built *c.* 1925, 71cm. long

The sale also includes model ships, automobilia, early domestic and office equipment, medical instruments and accessories, balances, scientific instruments, microscopes and telescopes.

On View: 28th February to 2nd March, 9.30am–4.30pm.

Enquiries about this sale should be addressed to HILARY KAY or ANDREW DOMLEO

Sotheby's Belgravia,
19 Motcomb Street, London SW1X 8LB
Telephone: (01)235 4311 *Telegrams:* Gavel, London *Telex:* London 24454

SMOKE RINGS

A Commentary by the Editor

M.E. Exhibition success

With the doors now closed on the 1978 M.E. Exhibition, the usual inquests will be held and, hopefully, steps taken to ensure that problems are as near as possible eliminated for the 1979 Exhibition. Some visitors have expressed concern at the time they were obliged to wait outside on the week-end days and if there were some ways in which this could be eliminated it would certainly be evaluated. Unfortunately the organisers are restricted by law to the number of people allowed inside the building at any one time and on the busiest days a queue outside is inevitable. Most people who did wait seemed to find plenty with which to amuse themselves. The final gate figures show an attendance of 78,925, the highest yet.

N.A.M.E. Exhibition

Steve Baker, President of North Staffs. Models Society, has written to tell us that arrangements are well in hand for the 1978 Northern Association of Model Engineers' Exhibition scheduled for 23 March at the Cross Heath Drill Hall, Newcastle-under-Lyme, Staffs. The show, which will be opened at 2.30 p.m. by His Worship the Mayor of Newcastle-under-Lyme, will run each day from 10 a.m. until 8 p.m. until 28 March except on Sunday 26 and Tuesday 28 when it will close at 6 p.m. There are 14 competition classes, some open to non-members of the Association, and a panel of judges has been selected, including Professor D. H. Chaddock and Mr. Wilfred Tucker. Entry forms are available from the secretary, Mr. S. J. Daw, 177 Queens Road, Penkhull, Stoke-on-Trent, Staffs. Tel. 0782 48942.

How about that holiday?

Some visitors to the Exhibition paid a visit to the Pontins stand to arrange their holidays for the coming year. News published in the various club circulars indicates an overwhelming support for the Model Makers' Festival type of holiday and this year there are two, at Southport from 23-31 March, and at Brean Sands from 7-14 October. Pontins now has the booking forms for both these holidays and if you haven't already done so, now is the time to book. True, last year's event was blessed by unusually good weather for October, but it could well do the same this year and in any case the indoor activities (model-wise) are designed to avoid any hint of boredom.

Steam vehicles

We have just heard from *Steam Power,* of Kirk Michael, Isle of Man, about a new steam engine which is being made commercially available ready to run. This is not a model but a full-size, V-compound, producing 35 b.h.p. yet capable of being carried by two men. Called the "Panther", this clean design uses gas, liquid or solid fuels and will operate on high pressure, superheated steam, or low pressure, tests having been satisfactory down to 40 p.s.i. It could well operate on lower pressures; that hasn't yet been tried. Peak revs. are 2500 with maximum power at 2250, so for stationary and some mobile work a gearbox may not be necessary. For really heavy hauling, however, some form of gearing would be necessary. It should power a 70 ft. canal boat with ease and is readily adaptable to road or rail vehicles. The H.P. cylinder is 1.75 in. and the L.P., 3 in. Weight is 168 lb.

Gem Craft Exhibition

An international exhibition of gems, jewellery, and related crafts is to be held at Grosvenor House Hotel, London, from 25-27 March. Called International EXPO, the event is being organised by *Gem Craft,* one of *M.E.*'s sister magazines, and is expected to attract over 150 stands with visitors coming from world-wide.

Return of "Adam"

This old loco was built in 1916 by Peckett & Son of Bristol for the Cleveland Bridge & Engineering Company of Darlington. It saw regular service until 1961 transferring steelwork from the works to the main sidings at Darlington, and again in 1974 when a diesel engine broke down. Now the company has presented "Adam" to the Cambrian Railway Preservation Society which has an agreement with British Rail for the use of nine miles of track in North Wales/Salop.

MODEL ENGINEER EXHIBITION 1978
RESULTS and AWARDS

	Class	*No.*	*Name and Town*
DUKE OF EDINBURGH CHALLENGE TROPHY	D.o.E.	3	**G. R. Michell,** Ramsgate
BRADBURY-WINTER CHALLENGE CUP	K	4	**P. B. Allen,** Wokingham
CREBBIN MEMORIAL & HENRY GREENLY AWARD	A	11	**R. M. Ordish,** Blandford
J. N. MASKELYNE MEMORIAL TROPHY	A	1	**I. E. Lewis,** Solihull
AVELING-BARFORD TROPHY	L	1	**L. J. Evans,** Harleston
BOWYER-LOWE CHALLENGE CUP	N	3	**S. D. W. Williams,** Newport
H. V. EVANS TROPHY	F	8	**T. Furey,** London
"BRISTOL" CHALLENGE CUP	AC	19	**E. J. Vine,** Bexleyheath
L.B.S.C. MEMORIAL TROPHY	A1	1	**W. R. Skuse,** Ramsgate
WILLIS CHALLENGE CUP	H	10	**Edouard Colpin,** France
NEW ZEALAND CUP	A	5	**J. D. Roberts,** Horley
MODEL RAILWAYS BOWL	B J	2 1	**J. Brierley,** N. Lancing **W. A. Bowie,** Ayr
STUDENTS CUP	O	2	**Westinghouse Brake and Signal Co. Ltd.,** Chippenham
SCHOOLS' COMPETITION	Not awarded		
JOHN GRAY MEMORIAL TROPHY (N)	S	1	**S. A. McGhie,** Enfield
H. C. WHEAT CHALLENGE CUP (B)			**J. Brierley**
HOT AIR ENGINE COMPETITION			1st Prize £50. **F. R. Wilkinson** 2nd Prize £25. **F. B. Thomas**
EDGAR WESTBURY MEMORIAL TROPHY	J	1	**W. A. Bowie,** Ayr

DUKE OF EDINBURGH CHALLENGE TROPHY

No.	*Description*	*Name and Town*	*Award*
3	"M.V. Machaon"	**G. R. Michell,** Ramsgate	**Duke of Edinburgh Challenge Trophy**
5	Bellis-Morcom Triple Expansion Engine	**G. E. Hartung,** Gravesend	**Runner up**

STUDENTS' CUP

2	Working Model of a Burrell Traction Engine	**Westinghouse Brake and Signal Co. Ltd.,** Chippenham	**Students' Cup**

CLASS A. LOCOMOTIVE 2½ IN. GAUGE AND OVER

11	1847 G.W.R. Broad Gauge 8 ft. Single	**R. M. Ordish,** Blandford	**Championship Cup and Crebbin Memorial Trophy**
1	Stanier Class 5 4-6-0	**I. E. Lewis,** Solihull	**Silver Medal and J. N. Maskelyne Memorial Trophy**

No.	*Description*	*Name and Town*	*Award*
3	"Wren" L.&Y. Rly. 0-4-0 St. Works Shunter	**G. J. Kimber,** Ditton	**Silver Medal**
8	Based on L.M.S. Standard 4-4-0 3-cylinder Compound	**V. C. Gotrel,** Solihull	**Silver Medal**
6	L.N.E.R. B1	**A. C. Hall,** Feltham	**Bronze Medal**
9	Dean Goods Engine	**B. Gavins,** West Yorks.	**Bronze Medal**
5	57 xx G.W.R. Pannier Tank (L.B.S.C. "Pansy")	**J. D. Roberts,** Horley	**V.H.C. Certificate and New Zealand Cup**
16	L.B.S.C. "Doris", Class 5	**T. W. Withnell,** Preston	**H.C. Certificate**
4	3½ in. "Rob Roy" Caledonian	**B. Goldsmith,** Luton	**H.C. Certificate**
12	"Rob Roy"	**C. B. Chandler,** Beaconsfield	**C. Certificate**

CLASS A1. LOCOMOTIVES TO ANY L.B.S.C. DESIGN 2½ IN. GAUGE AND OVER

1	"Pansy"	**W. R. Skuse,** Ramsgate	**LBSC Memorial Trophy**

CLASS B. LOCOMOTIVES IN GAUGES "I" AND "O"

2	Rebuilt Merchant Navy No. 35006 "Peninsular & Oriental SN Co"	**J. Brierley,** N. Lancing	**Silver Medal and Model Railways Bowl**
1	American Type 4-4-0 Loco and Tender. Circa 1865	**A. S. Holt,** Whitton	**V.H.C. Certificate**
3	Abergavenny Steam Loco Boiler Stephenson Valve Gear	**A. H. Matson,** Honiton	**V.H.C. Certificate**
4	L.S.W.R. 4-4-0 Locomotive Class T3 No. 571	**J. P. Preston,** Guildford	**H.C. Certificate**
6	"Jinty" L.M.S. 0-6-0	**Tom Nunn,** Derby	**H.C. Certificate**
7	Baldwin Switcher	**E. E. Chivers,** Fareham	**C. Certificate**
8	Statesman	**E. E. Chivers,** Fareham	**C. Certificate**
9	Garratt 0-6-0 + 0-6-0	**W. E. Lever,** Birmingham	**C. Certificate**

CLASS BA. LOCOMOTIVES IN GAUGES SMALLER THAN "O"

2	L.M.S. 4-4-0 Compound	**G. O. Jones,** Barnet	**V.H.C. Certificate**

CLASS C. ROLLING STOCK AND ACCESSORIES, GAUGES "I" AND "O" OR LARGER

5	G.W.R. Streamlined Railcar	**F. E. Hemming,** Otton	**H.C. Certificate**
2	Aberllefenni Quarry Slab Car	**M. R. Harrison,** Brentwood	**H.C. Certificate**
1	Volk's Electric Railway, Brighton Original Car 1883	**W. A. Brewer,** Greenwich	**C. Certificate**
4	42 ft. L.M.S. Parcels Van—End Loading	**T. Nunn,** Derby	**C. Certificate**

CLASS CA. ROLLING STOCK AND ACCESSORIES, GAUGES SMALLER THAN "O"

2	7 Railway Wagons	**G. O. Jones,** Barnet	**V.H.C. Certificate**
3	G.W. "Macaw" Rail Wagon	**R. Bennett,** Denby	**V.H.C. Certificate**
1	L "O" Class Coaches of the L.B.N.G.R.	**T. Ratcliffe,** London	**C. Certificate**

CLASS D. STEAM AND MOTOR SHIPS OF ANY PERIOD (NON-WORKING)

4	U.S.S. "England", DE 635 Buckley Class	**E. R. Dyke,** Wivenhoe	**Silver Medal**
12	H.M.S. "Hood", Battlecruiser (1933)	**B. L. C. Hill,** St. Albans	**Bronze Medal**
6	R.M.S. "Antonia", Cunard Line	**S. R. C. Walmsley,** Formby	**H.C. Certificate**

CLASS E. POWER-DRIVEN BOAT MODELS COMPLETE WITH POWER PLANT

5	H.M.S. "Vendetta"	**D. C. Brown,** London	**Championship Cup**
21	Scale 56 ft. Motor Fishing Vessel	**A. Phillips,** Bishops Stortford	**Bronze Medal**
1	"La Calypso"	**B. Gray,** Newport Pagnell	**H.C. Certificate**
22	R.A.F. Range Safety Launch	**J. Goddard,** Plymouth	**H.C. Certificate**

CLASS F. SAILING SHIPS OF ANY PERIOD (NON-WORKING)

2	H.M.S. "Haddock", Schooner	**J. Pheby,** Beckenham	**Championship Cup**
8	Shannon One Design	**J. Furey,** London	**H.V. Trophy**

No.	*Description*	*Name and Town*	*Award*
3	Brigantine "Leon"	**J. Brooks,** Leicester	**Silver Medal**
5	Northumberland Coble	**D. Stevens,** London	**Bronze Medal**
7	"Lilla Dan", Sail Training Vessel	**J. S. Harper,** London	**Bronze Medal**
1	Brixham Trawler "Juniper"	**John F. Nixon,** London	**V.H.C. Certificate**
14	Grand Banks Schooner in Dry Dock	**P. G. Allen,** Horsham	**V.H.C. Certificate**
6	"Etoile", French Schooner	**E. P. Heriz-Smith,** Tunbridge Wells	**C. Certificate**
9	Reed Raft	**N. Margiocchi,** Denby	**C. Certificate**
11	"Scotia"	**R. H. Landen,** S. Harrow	**C. Certificate**
13	"Strive"	**T. W. Dickey,** N. Ireland	**Silver Medal**

CLASS G. WORKING YACHTS AND SAILING SHIPS

1	Bermudan Rigged Sloop	**J. T. Richards,** Goring-on-Thames	**Silver Medal**
3	R/C 10-rater Yacht	**K. D. Cherrington,** Walton-on-Thames	**Silver Medal**
2	International Gaff Rigged Clinker Dinghy	**A. J. Sheppard,** Newbury	**V.H.C. Certificate**

CLASS H. HYDRO-PLANES AND SPEED BOATS

10	Airscrew Hydroplane	**Edouard Colpin,** France	**Willis Cup**
5	"I Snuffle" Offshore Power Boat	**P. B. Allen,** Wokingham	**Silver Medal**
2	Wing Ding R/C Hydroplane	**D. Collings,** Bexley	**H.C. Certificate**

CLASS I. MINIATURES

6	Full Rigged Ship "Thermopylae"	**D. Hunnisett,** Aylesbury	**Championship Cup**
5	H.M.S. "Royal Oak", 1939	**G. F. S. Winrow,** Birkenhead	**Bronze Medal**
3	English Merchant Ship c. 1530	**E. P. Heriz-Smith,** Tunbridge Wells	**H.C. Certificate**
11	Algerian Chebec, 1780	**P. Jackson,** Orpington	**H.C. Certificate**
4	Full Rigged Ship "Mount Stewart"	**J. A. Evans,** Thornton Heath	**C. Certificate**
9	U.S.S. "Alabama"	**A. Crisp,** London	**C. Certificate**
10	H.M.Y. "Britannia"	**A. G. Calvert,** E. Twickenham	**C. Certificate**
2	Late 15th Century French Ship	**J. Barton,** London	**C. Certificate**

CLASS KC. KIT CLASS—FOR ANY MODEL BOAT BUILT FROM A COMMERCIAL KIT

1	H.M.S. "Ambuscade", Type 21 Frigate	**D. J. Abbott,** Luton	**Cup**
4	"Bluenose", Grand Bank Schooner	**K. Gardner,** Pinner	**H.C. Certificate**

CLASS J. GENERAL ENGINEERING MODELS WORKING (INCLUDING STATIONARY AND MARINE ENGINES)

7	Starboard Engine and Part Hull of Mississippi Sternwheel Towboat	**G. E. Hartung,** Gravesend	**Silver Medal and Championship Cup**
1	Flash Steam Engine	**W. A. Bowie,** Ayr	**Bronze Medal and Edgar Westbury Memorial Trophy**
5	Rotary Beam Engine	**D. Rouse,** Salcombe	**V.H.C. Certificate**
8	Open Type Steam Compound Condensing Generating Set	**C. T. J. Nicholls,** Churchdown	**H.C. Certificate**
9	A Reversing Vertical Compound Steam Engine	**K. J. Hyder,** Hemel Hempstead	**C. Certificate**

CLASS K. INTERNAL COMBUSTION ENGINES

4	35 cc. Petrol Engine	**P. B. Allen,** Wokingham	**Silver Medal and The Bradbury Winter Memorial Trophy**
7	8-cylinder Internal Combustion Engine	**Edouard Colpin,** France	**Bronze Medal**
1	Design Modified "Mastiff" 4-cylinder 24 cc. Water Cooled Petrol Engine	**J. Dempster,** Ockbrook	**V.H.C. Certificate**

No.	*Description*	*Name and Town*	*Award*
6	Radial Aero Engine	**L. C. Mason,** London	**V.H.C. Certificate**
2	15 cc. Racing Glow Engine	**P. B. Allen,** Wokingham	**H.C. Certificate**
3	Freelance 20 cc. Four Stroke Twin Cylinder Petrol Engine	**G. E. Wolfe,** Littlehampton	**H.C. Certificate**

CLASS L. MECHANICALLY PROPELLED ROAD VEHICLES (INCLUDING TRACTORS) AND SOME CLASS J

L.1	Traction Engine	**L. J. Evans,** Harleston	**Silver Medal and Aveling-Barford Trophy**
J.2	Marshall Portable	**R. L. Kibbey,** Derby	**Championship Cup**
L.2	Burrell Traction Engine	**A. Robelou,** Enfield	**Silver Medal**
J.3	Working Model Burrell Compound Scenic Showman's Locomotive	**E. F. Stratton,** Westcliff-on-Sea	**Silver Medal**
L.11	Birmingham Corporation Tramcar	R. H. Whetstone, Bromsgrove	**Silver Medal**
L.7	Open Sided Single Deck West Ham Tram	**J. R. Prentice,** Romford	**Bronze Medal**
L.8	Allchin Royal Chester Design by the late Bill Hughes	**P. J. Marsden,** Woodthorpe	**Bronze Medal**
L.9	"Minnie" Traction Engine	**L. H. Doughty,** Fakenham	**Bronze Medal**
L.10	Showman's Road Locomotive based on "Minnie"	**W. G. Skinner,** Coventry	**Bronze Medal**
L.13	Liverpool Corporation Tramways	**L. J. Taylor,** Dunstable	**Bronze Medal**
L.5	Wallis & Steevens "Simplicity"	**J. Cousins** and **P. Fuller,** Northolt	**V.H.C. Certificate**
L.3	Scratchbuilt, Aveling & Porter, Roller	**R. Dunk,** Aberdeen	**V.H.C. Certificate**
L.6	London Tramcar	**P. E. Smith,** Twickenham	**V.H.C. Certificate**

CLASS N. TOOLS AND WORKSHOP APPLIANCES

3	Ess Dee Electric Spark Erosion Machine	**S. D. W. Williams,** Newport	**Silver Medal Bowyer-Lowe Challenge Cup**
2	Duplex Drill Grinding Jig adapted to Quorn tool and cutter grinder	**I. Strugnell,** Loughton	**Bronze Medal**
5	3 in. Screwcutting Lathe	**J. Read,** London	**V.H.C. Certificate**
1	Tool Cabinet, Stand and Accessories for Watchmaker's Lathe	**J. F. Lowndes,** Blackpool	**C. Certificate**
7	Injection Moulding Die	**G. O. Jones,** Barnet	**C. Certificate**
8	Drill (M.E. design)	**J. L. Canner,** Bristol	**C. Certificate**

CLASS O. ENGINEERING SCALE MODELS (NON-WORKING)

3	.410 Shotgun	**C. R. Tucker,** Lewes	**Silver Medal**
8	German Anti-tank Gun Pak 38	**H. Gavins,** Keighley	**Bronze Medal**
7	1.H Titan (Tractor)	**P. A. W. Fulkner,** Thames	**V.H.C. Certificate**

CLASS P. SCENIC AND REPRESENTATIONAL MODELS (INCLUDING ARCHITECTURE)

8	"Harrier" Assembly Line	**T. Bolton, A. Hamilton, D. Boyne,** Kingston-on-Thames	**Silver Medal**
10	"Not For Sale"	**J. M. Webster,** Codnor	**Bronze Medal**
9	Carousel	**J. W. Stanmore,** Welwyn Garden City	**H.C. Certificate**

CLASS Q. HOROLOGICAL, SCIENTIFIC AND OPTICAL APPARATUS

3	Vienna Regulator Wall Clock	**M. R. Shaw,** Bradford	**Silver Medal**
7	Electrical Free Balance Table Chronometer	**A. J. Fox,** London	**Silver Medal**
6	Skeleton Clock	**E. Watons,** Oldham	**Bronze Medal**

No.	*Description*	*Name and Town*	*Award*
1	Franklin Longcase Clock	**J. F. Lowndes,** Blackpool	**V.H.C. Certificate**
4	Congreve Clock	**J. R. McKee,** Worcester	**V.H.C. Certificate**
9	Regulator Clock	**F. M. Gartside,** Pinner	**C. Certificate**
2	17th Century Striking Lantern Clock with Bracket	**L. E. Wynne,** Wembley	**C. Certificate**
10	John Wilding 8 Day Clock	**H. W. J. Woodward,** Littlehampton	**C. Certificate**
5	Galileo Escapement	**H. W. J. Woodward,** Littlehampton	**C. Certificate**

CLASS R. GENERAL CRAFTSMANSHIP—NOT OTHERWISE CLASSIFIED

12	Singer Tricycle circa 1879	**C. F. Adams,** Ruislip	**Silver Medal**
6	Burton Gipsy Wagon Eight Horse	**I. & D. Fear,** Egham	**Silver Medal**
17	Case Duelling Pistol	**E. G. Parkes,** Surbiton	**V.H.C. Certificate**
10	French Napoleonic 12 pdr. Gun	**D. A. Walkom,** Rochford	**V.H.C. Certificate**
18	Ship in Bottle	**H. Reynolds,** Cromer	**C. Certificate**
9	Decorated Brass Candlestick	**T. D. Walshaw,** Westmorland	**C. Certificate**
8	Decorated Ivory Box	**T. D. Walshaw,** Westmorland	**C. Certificate**

CLASS S. FOR ANY TYPE OF MODEL OR MECHANICAL WORK (EXCEPT MILITARY MODELS OF FIGURES) BY A JUNIOR

5	Glider	**S. Wheeler,** London	**Silver Medal**
56	Oscar the Troll		**Bronze Medal**
22	Ship of the Cinque Ports Fleet 1284	**C. J. Burchell,** Sutton Coldfield	**V.H.C. Certificate**
20	Waiting for Master	**Samantha Hullis,** Ipswich	**V.H.C. Certificate**
1	Small Bench Drill	**S. A. McGhie,** Enfield	**John Grey Memorial Trophy and H.C. Certificate**
48	B.R. Car Ferry	**B. Dove,** Romford	**C. Certificate**

CLASS AA. FLYING MODELS OF ALL TYPES

1	R/C Aerobatic Pylon Racing Glider (with water ballast)	**G. Rae,** Gt. Malvern	**Bronze Medal**
11	Seeker	**K. D. Stokes,** Oxford	**V.H.C. Certificate**
13	A/2 International F1A Class Glider	**M. Dilly,** West Wickham	**V.H.C. Certificate**
8	"Cirro Stratus" High Performance Thermal Soarer	**M. J. K. Tuck,** St. Albans	**H.C. Certificate**
3	Kingfisher F.A.I. Class Speed Model	**G. Isles,** Macclesfield	**H.C. Certificate**
2	Delta Speed Control Line Model	**G. Rae,** Gt. Malvern	**C. Certificate**
7	1/2 A Contest Power Model	**J. P. Buskell,** Claygate	**C. Certificate**

CLASS AB. SCALE FLYING MODELS

1	Bell 47G Helicopter	**J. Morley,** Weybridge	**Bronze Medal**
11	Curtiss Jenny	**M. Okey,** Letchworth	**Bronze Medal**
10	Avro Lancaster	**L. K. Wells,** Havant	**V.H.C. Certificate**
5	Bristol Beaufighter	**G. P. Redman,** Keighley	**H.C. Certificate**
9	Piaggio P166 control line	**D. W. Newby,** Derby	**H.C. Certificate**
8	Westland Lysander	**D. W. Newby,** Derby	**C. Certificate**
4	Comper "Swift"	**A. P. Britton,** Alvaston	**C. Certificate**
12	AER Macchi C202	**T. W. Waters,** Petts Wood	**C. Certificate**

CLASS AC. SCALE (NON-FLYING) MODELS

18	Walrus on Marine Catapult	**H. Woodman,** London	**Championship Cup**
19	Bristol Blenheim 1F	**E. J. Vine,** Bexleyheath	**Bristol Cup**
13	D.H.86 of Union Airways	**A. F. Woollett,** Wokingham	**Silver Medal**
6	Hawker Tempest V	**P. Cooke,** Twyford	**Bronze Medal**
22	F-4 Phantom	**T. Taylor,** London	**Bronze Medal**

No.	*Description*	*Name and Town*	*Award*
5	R.A.E. BE 2 F	**R. A. Burgess,** Kingston-on-Thames	**V.H.C. Certificate**
7	Spitfire Mk. X1VC	**P. Cooke,** Twyford	**V.H.C. Certificate**
4	Percival Mew Gull E3H	**D. J. Collins,** Claygate	**H.C. Certificate**
2	B-17G Flying Fortress	**N. J. Thomas,** Basingstoke	**C. Certificate**

The following class was created to cater for a number of racing car entries

CLASS M. WORKING RACING CARS

No.	*Description*	*Name and Town*	*Award*
1 (was L.14)	Prototype R/C Car	**M. Pret,** France	**Bronze Medal**
2 (was R.19)	5 cc. Speed Car	**Mario A. Ferrero,** Italy	**H.C. Certificate**
3 (was R.20)	Tether Car 2.5 cc.	**A. Malik,** West Germany	**H.C. Certificate**
4 (was R.23)	Tether Car 5 cc.	**H. Denneler,** West Germany	**H.C. Certificate**
5 (was R.24)	Tether Car 10 cc.	**M. Pfefferle,** West Germany	**H.C. Certificate**

CLASS MA. DIORAMA. Competition for Diorama composition for any type or size of figures or scenery to be of Military, Naval or Air Force character.

No.	*Description*	*Name and Town*	*Award*
19	Sinai Desert—1973	**I. Craig,** Salisbury	**Bronze Medal**
60	A Near Run Thing—1815	**G. Bickerton,** Wirral	**Bronze Medal**
71	Pacific Onslaught	**J. Jarzembowski,** London	**Bronze Medal**

CLASS MB. UNCONVERTED SINGLE FIGURES

21	The New Found Friends	**J. B. Woodley,** London	**Bronze Medal**

CLASS MC. SCRATCH BUILT OR CONVERTED SINGLE FIGURES

37	"Ta-Ta 13th Century"	**P. Wilcox,** London	**Silver Medal**
68	Dutch Courage	**P. J. Dibley,** Basingstoke	**Bronze Medal**

CLASS MD. SINGLE MILITARY VEHICLES OR ARTILLERY

11	1914-1918 Thornycroft Workshop Lorry	**R. C. Lightheart,** Welling	**Silver Medal**
10	5 in. B.L. Armstrong Gun	**A. Jeffryes,** Birmingham	**Bronze Medal**

CLASS MJ1. SINGLE FIGURES (JUNIOR ENTRANTS)

16	French Dragoon Trumpeter	**M. Warham,** Leeds	**1st**
14	95th Rifles. Officer 1815	**G. Scopes,** Tadworth	**2nd**
22	Private 93rd Highlanders	**D. Parker,** Newbury	**3rd**
33	Officer Mameluke 1805	**J. Hullis,** Ipswich	**4th**

CLASS MJ2. SINGLE VEHICLES, ETC. (JUNIOR ENTRANTS)

11	Italian Carro Armato	**E. J. Skinner,** Tunbridge Wells	**1st**
24	3.7 cm. PAK 35/36 "Bren"	**R. Farish,** London	**2nd**
1	Fiat Ansaldo M13/40	**R. Mussett,** Rickmansworth	**3rd**
31	Vickers Light Tank	**A. Carroll,** Sutton Coldfield	**4th**

CLASS MS1. MILITARY BANDSMAN

9	Landsknecht Drummer 1525	**D. M. Catley,** Reigate	**1st**
1	Timpanist Burgundian Gendarmes 1740	**R. V. Hailes,** Stanmore	**2nd**
7	Piper Bengal Infantry 1895	**D. M. Catley,** Reigate	**3rd**
8	Italian Military Bandsman	**D. M. Catley,** Reigate	**4th**

CLASS MS2. MODIFIED OR SCRATCHBUILT

1	Light Armoured Car	**J. A. Thomason,** Cranleigh	**1st**
4	Sd. K/Z 234/1	**M. Roberts,** Andover	**2nd**

CLASS WA. CABINET MAKING

7	Rosewood Table	**G. R. Bailey,** Newcastle	**1st**
3	Chair	**N. Batchelor,** Cirencester	**Award of Merit**
12	Bracket Clock	**R. Palmer,** Crowthorne	**Award of Merit**

Continued on page 197

'SUGAR'

Rex Tingey continues with the construction of his 2½ in gauge 0-4-0 tank loco

WHILST IN THE HABIT of working with copper make the smokebox mainly from the same diameter copper tube as the boiler. Cut a ¼ in. deep ring and cut through with a thin saw. Anneal the split ring and fit it carefully around the tube from which it has been cut, leaving ⅛ in. proud; braze it in place with the minimum of Phosphalloy, do not pickle or anneal but allow it to cool by itself. Saw off the double ring close, and cut a length of the same tube for the outside of the smokebox, sawing a slit across.

Turn the front ring from brass, mine was from 2 in. dia. and so a split ring had to be brazed on to bring it level; the ring could be made from 2⅛ in. brass and this extra work avoided. Anneal the piece for the outside, fit the front and back rings and bend the outer to form part of the saddle. Do not allow the outer to sag in the middle but keep the sides parallel, beating it on a piece of round if necessary, before brazing. Braze in the ring for the boiler end first with Phosphalloy, ring flat on the asbestos. Fit the front ring, place this down and braze in as before, pickle to clean it up and check the fit onto the boiler, grinding off any filler which has intruded, using a wheel-shaped dental burr.

Turn the door from the 2 in. dia. brass, keeping it solid. Make the locking bar and silver solder it in place with Easyflow No. 2 after fluxing. Check that the door fits tightly. Straighten the bottom of the box and measure it for the rest of the saddle, which is tailor made from 16 gauge brass to be silver soldered into position, with tongues on the back and front plates to fill in the gaps in the split rings.

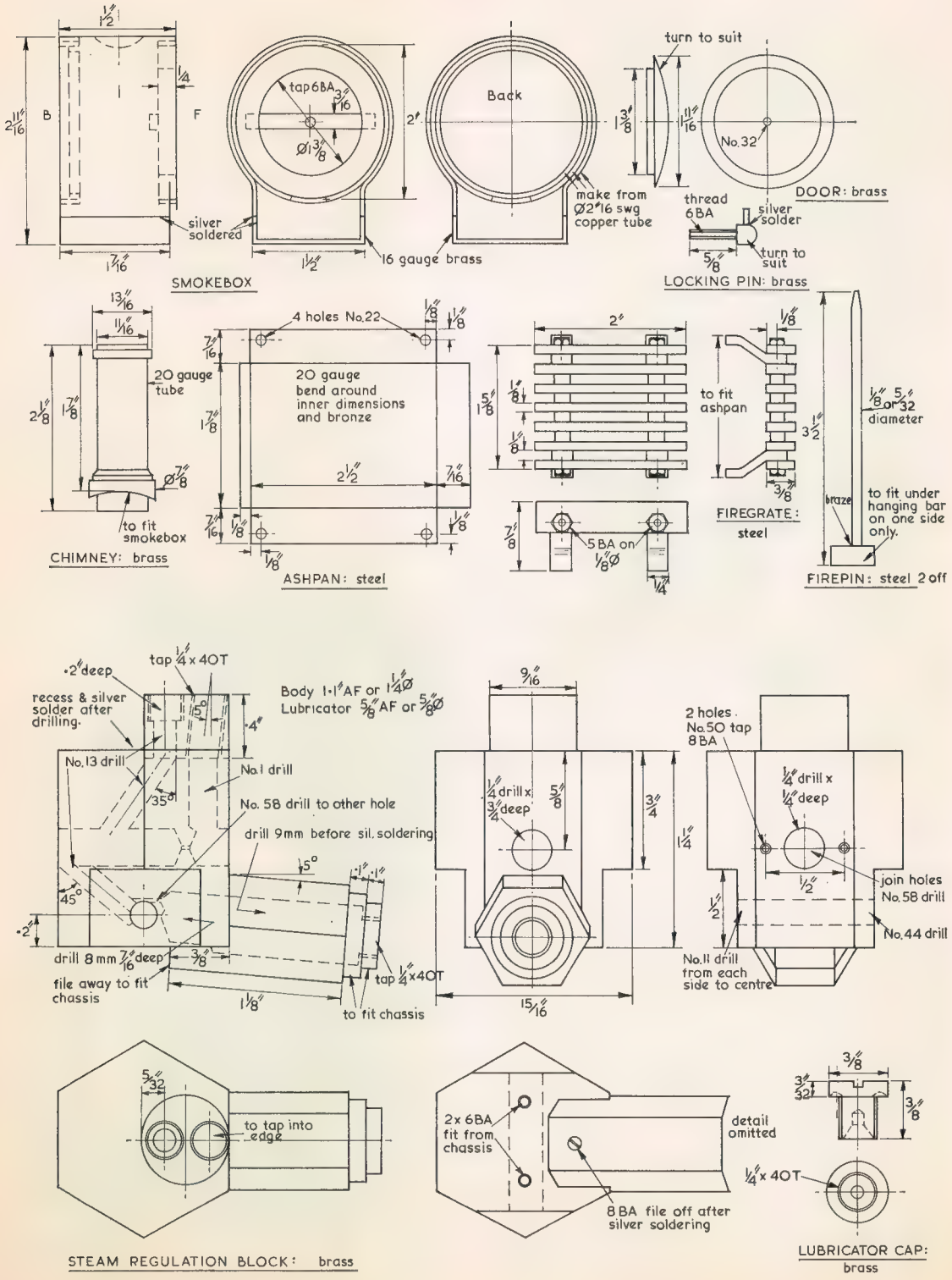
The chimney is a piece of brass tube with a ring silver soldered to the top and a saddle silver soldered to the bottom and to the smokebox; the tube protrudes into the box as a petticoat pipe. The saddle can be flycut or just filed to shape before fitting. Clean up the smokebox and file up nice flat sides front and back. Drill out the door and locking bar, tapping the bar, and make the door fastener.

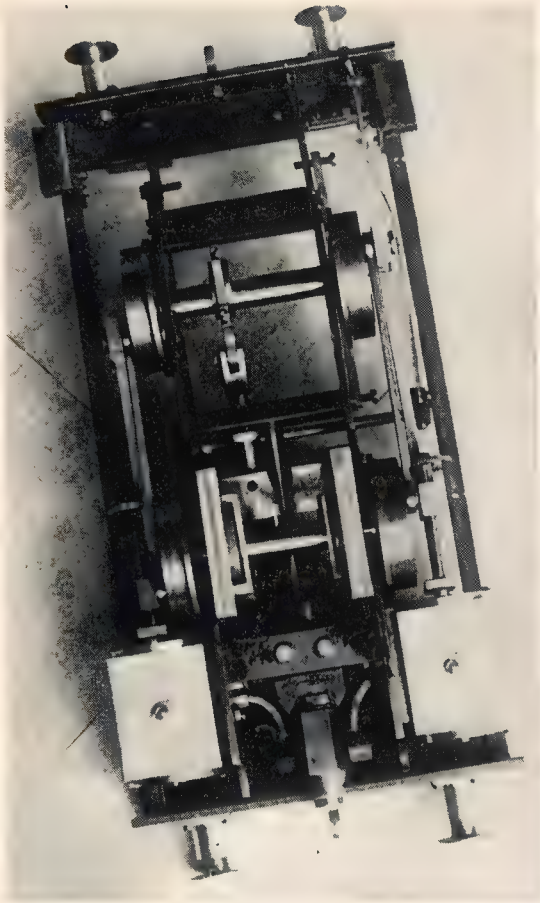
The Steam Regulation Block

Before fitting the boiler and smokebox the steam regulation block must be made and located so that the steam connections and saddle can be correctly positioned, and before fitting the block an "extra design feature" by way of an exhaust expansion chamber is required. This was an afterthought to simplify the exhaust system for a single union into the block. Originally a simple T-junction was envisaged, but it became a hexagon chamber into which the exhausts from the two outside cylinders are taken, with a generous interior to give the steam a chance to cool and expand, and so provide a better blast, when taken through the regulation block to the blast nozzle. Joints to the hexagon chamber are silver soldered but the tubes are secured into the blocks with Loctite.

The steam regulation block has a heavy body of hexagon brass; if you have no hex. of this size it can be made from round with little alteration. Cut the block to length and turn each end flat. Transfer to the four-jaw chuck to turn out the shallow bore to take the top extension; avoid leaving a peak or trough in the centre. Make the top extension and drill this for the steam and then the angled hole for the exhaust, not worrying if this hole breaks through the outside a little. Check that it fits, not too tightly or it will pop out when heated. Mark out and drill the exhaust system, holes do not have to match exactly, and I have avoided the third dimension, as far as possible, to make the block easier to build. Drill all the steam passage before milling off the lower sides, drilling the two side holes from each side, and not straight through. Lastly drill the very small holes, one for the blower from the exhaust into the regulator chamber, and the other from the lubricator chamber into the block just above the steam inlet. Both these holes are positioned so that they can be cleared *in situ* should they become blocked in running.

The lubricator is drilled, from hexagon brass, in the four-jaw chuck slightly off centre to allow a little extra for the tongue, which is left after milling, at an angle. Drill and screw the lubricator to the body and try in place to ascertain how much of the front needs taking down to fit under the buffer beam. The front should be about flush with the beam and just not touching, so that the cap will protrude to be easily unscrewed, in use. The cap is turned with the same recess as the


SMOKEBOX
silver soldered
16 gauge brass
make from Ø2"16 swg copper tube
Back
tap 6BA
turn to suit
No.32
DOOR: brass
thread 6BA
silver solder
turn to suit
LOCKING PIN: brass
20 gauge tube
to fit smokebox
CHIMNEY: brass
4 holes No.22
20 gauge bend around inner dimensions and bronze
ASHPAN: steel
5BA on
to fit ashpan
FIREGRATE: steel
braze
to fit under hanging bar on one side only.
FIREPIN: steel 2 off
tap 1/4 x 40T
2" deep
recess & silver solder after drilling.
Body 1·1"AF or 1 1/4Ø
Lubricator 5/8"AF or 5/8Ø
No.13 drill
No.1 drill
No. 58 drill to other hole
drill 9mm before sil. soldering
drill 8 mm 7/16" deep
file away to fit chassis
tap 1/4" x 40T
to fit chassis
2 holes No.50 tap 8BA
1/4" drill x 1/4" deep
join holes No.58 drill
No.44 drill
No.11 drill from each side to centre
1/4" drill x 3/4" deep
STEAM REGULATION BLOCK: brass
to tap into edge
2x 6BA fit from chassis
detail omitted
8BA file off after silver soldering
1/4" x 40T
LUBRICATOR CAP: brass



Underside and topside views of the complete chassis unit.

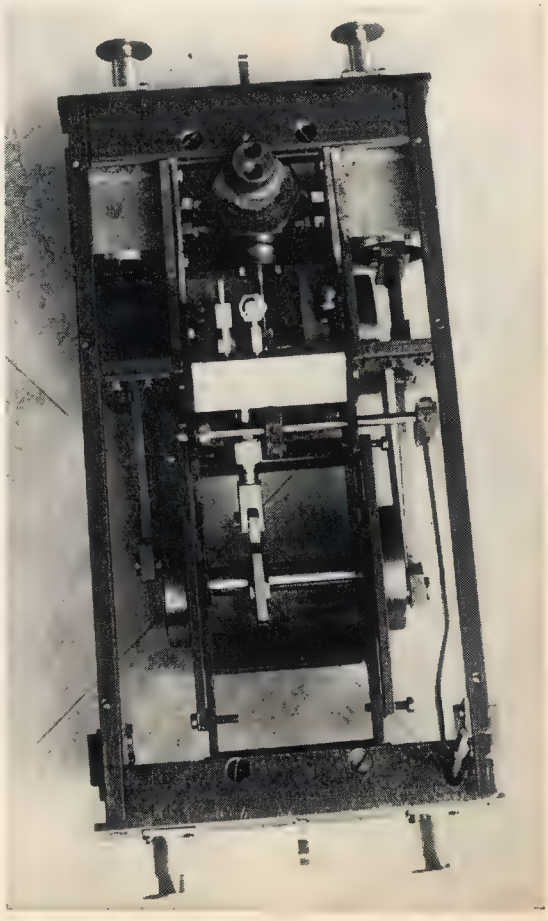
safety valve, for an "O" ring, and needs to be only finger tight.

To silver solder the block, flux the lubricator tongue and mating surface before securing with a short brass screw. Paint in the top extension with Easyflow paint and place on the asbestos board with this uppermost, to be heated up first. Have a length of Easyflow No. 2 ready, and get this warmed up with the first blow to pick up some flux, and, when the paint flows, add the No. 2 to give a good fillet ring. Then tap the lubricator block back into place as it will have distorted with the heat, and apply fluxed No. 2, turning the whole over to complete the joint at the base. When the red dies away dunk in the pickle bath, wash and examine the fillet line. Any poor or sunken line should be built up, applying Comsol flux, locally heating with a small flame and filling in with Comsol solder. Fit between frames, filing the lubricator joint to slide over the stretcher. Make the cap and tap the front, and before fitting run a No. 60 drill by hand to make sure the little hole is still open to steam and oil. Drill the stretcher and block to match, tapping the block 6 BA.

Carefully clean up all the holes in the block and tap, where required. Make the exhaust expansion chamber to fit and secure in place with Loctite 601 (not into the regulator yet). Thread the piston rod in the lathe, make an oversize piston, Loctite it onto the rod and turn in the Unimat to exactly $\frac{1}{4}$ in. diameter. Make the gland and cover plates from a bearing brass or gunmetal rod and fit the screws, tapping the block. Oil the piston before entering it into its hole, gasketing the gland plate in place with Loctite liquid gasket.

Steam and Water Fittings

Where possible steam and water fittings are made as push fits and adhered in place, rather than employing bulky screwed unions which need to be well over-scale in this size. In the steam side if the two parts to be joined are immobile, relative to each other, then short runs of pipe can be adhered in two opposing holes, using one deeper

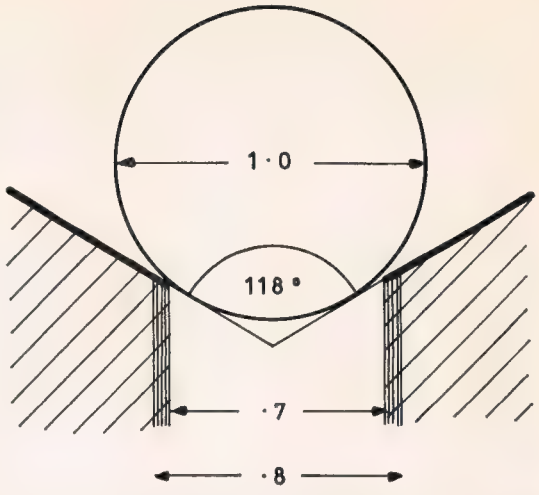


hole to slide the pipe and return for centralisation; pressure will be equal and opposite on the two joints (no piston effect) and the pipe will not move under pressure. On the exhaust side pressure is lower and longer runs with bent pipes can be tolerated. In the water side the water into the pump can be just adhered, but from the pump to the by-pass valve and backhead clack it is safer to use proper unions, and also more convenient for ease of dismantling, as it is in some other cases. By-pass to tank fittings can be adhered.

For convenience it is an easy matter to solder small hexagon rings on pipes near joints to be adhered, to give a means of releasing adhesion without damage to pipes. Whenever an adhered joint is dismantled turn the right size drill into the hole and clean up the pipe before re-adhering, otherwise the joint will not be good.

Water Valves

The ball valves are unconventional in that the seats are formed with a standard 118 degree twist drill end, rather than with a D-bit, to give a flat surface to the seat. The conical seat is not an improvement over the flat, but just easier to make and requiring no special tools. The valve works just as well if the proportions of ball to seating hole are kept right. The diagram shows the correct seat with the hole diameter between .7 and .8 of the ball diameter; less than this can cause deformation of the seating surface upon fitting, and larger causes too great a seating wedge after fitting, with a possibility of sticking. All tests of this valve seat formation were carried out in hard brass, other metals may need a different configuration. There is no reason why the seat should not be made with a D-bit, and flat, if required. *To be continued*



The 3 February issue (page 129) suggested that hard asbestos be used for a hearth when brazing. This was of course an error. Mr. Tingey uses insulating board asbestos for his hearth, not the compressed as implied. **The latter is extremely dangerous when heated.**

No.	*Description*	*Name and Town*	*Award*
CLASS WB. WOODCARVING			
2	3 Male Figures	**I. Barrand,** Wakefield	**1st**
1	Welsh Loving Spoon	**C. R. Parsons,** Pontyclun	**2nd**
6A	Portrait in Lime	**P. Davies,** Newcastle, Staffs.	**3rd**
CLASS WC. WOODTURNING			
10	Walnut Vase	**A. F. Allen,** Kidderminster	**1st**
16	3 Goblets in Ash	**G. Cowen,** Stoke-on-Trent	**2nd**
9	Five Small Boxes	**D. J. Waghorn,** Harrow	**3rd**
CLASS WD. MUSICAL INSTRUMENT			
2	Acoustic Guitar	**J. Andrews,** W. Croydon	**1st**
CLASS WE. MARQUETRY/INLAY			
	No Award		
CLASS WF. MISCELLANEOUS			
3	The Entertainer	**D. Secrett,** Diss	**1st and Best in Show—Open Challenge Shield**
6	Stephenson's "Rocket"	**G. Carter,** Weybridge	**2nd**
4	Lute Playing Jester	**D. Secrett,** Diss	**3rd**
CLASS WG. HORSE DRAWN VEHICLES			
30	E. Anglian Farm Waggon	**M. Skeet,** Camberley	**1st**
6	Oxford or Woodstock Waggon	**A. J. Lown,** Croydon	**2nd**
25	Private Stage Coach	**S/Ldr. E. G. Brown,** Richmond	**3rd**
5	Northamptonshire Waggon	**A. J. Lown,** Croydon	**Award of Merit**
11	Reading Gipsy Caravan	**H. & R. Evans,** Buxton	**Award of Merit**
26	Courage's Dray	**L. A. Hart,** Farnborough	**Award of Merit**

JEYNES' CORNER

Gardner Engines

I TOO, NOTICED Mr. Croker's article in *Model Engineer* for 4 February, especially the apparently disparaging remarks concerning the Gardner diesel engine, and was very pleased to notice Mr. Outram's letter in "Post Bag" for 18 March, to combat the apparent slur cast upon these excellent engines, which I have known since the "F" type petrol engine appeared. This being fitted with HT magneto ignition, was a welcome change from the hot bulb type.

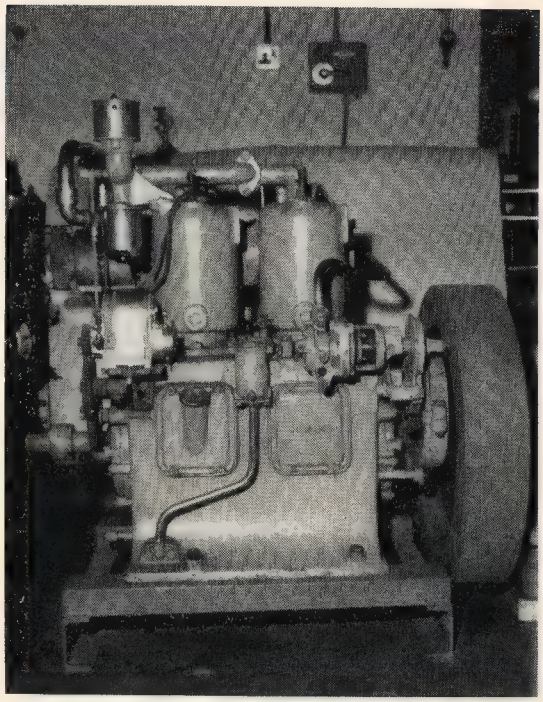
About the same time, the "H" type oil engine was introduced, this being fitted with compressed air starting. Another welcome change from manual starting. One of Gardner's small vertical gas engines gave many years' service in connection with the gas-holders sited at the Malvern Electricity Works, before, during, and after the 1914 war. Both gas and electricity undertakings, then municipally owned, were under one management.

Reverting to the Mosquito Creek episode (if such a place existed), regarding the attempts to generate electricity, I can envisage the set-up, poor or non-existent foundations for engine and dynamo, the former possibly taken from some worn-out truck, fitted up by unskilled labour, and probably well out of line. This would account for the vibration, and the omission of a silencer would account for the shocking noise. There would be no accumulators to help with peak load, and to hold the voltage reasonably steady.

I recently had the opportunity to visit the works of Mr. G. Flynn in Durham, to see and photograph a Gardner petrol engine built in 1916. This is a two-cylinder engine with magneto ignition, and forced water circulation. The cylinders are cast separately and bolted together, and altogether is a substantial job, well worth the journey to see it.

Possibly a few notes on the firm of Gardners may be of interest: the business started in a small way in 1868, the workshop being the basement of the building in which the founder of the business, Mr. L. Gardner, lived, carrying on the business of general engineering. It is certainly interesting to note that the famous 'Robinson' hot-air engines were built by Gardners. They had a bore and stroke of 10 inches, developing $\frac{5}{8}$ h.p. at 170 r.p.m. with a thermal efficiency of about 8 per cent in comparison with their modern products.

The first gas engine was made in 1893, and the first oil engine in 1894; both these had hot-tube ignition. In 1902 they produced the "M" type



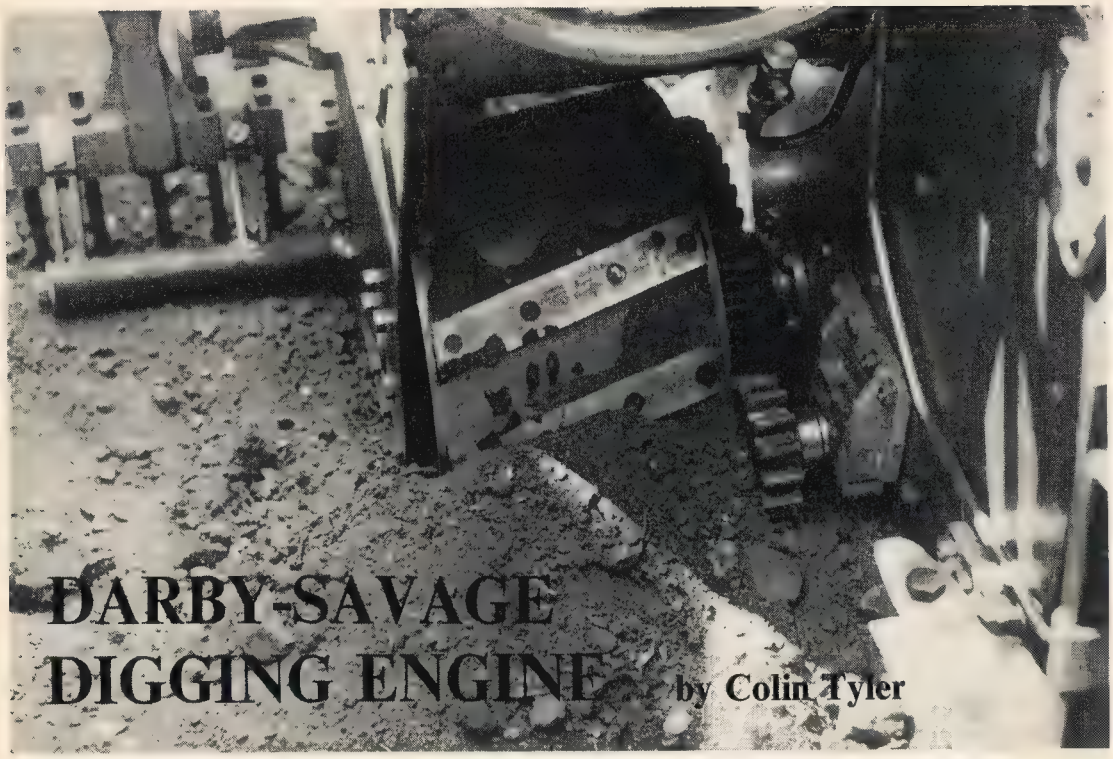
1916 two-cylinder Gardner petrol engine with overhead inlet valves and magneto ignition.

engine, which was supplied for many usages; the range extended from the 5 h.p. single cylinder to engines developing 200 h.p. The cylinders were all separate castings, and the engines were arranged to run on various fuels; gas, oil, paraffin, or petrol. Some of this type of engine were purchased by the War Office.

In 1903, the "V" type of engine was produced, which was intended principally for agricultural purposes, some being mounted on four wheels to make a self-contained power unit; these ranged in power from $1\frac{3}{4}$ to 10 horse power.

In 1910, three more types were introduced, the "F", the "H", and the "CR". The "F" ranged from $\frac{3}{4}$ to 14 h.p.; these were horizontal engines intended to run on petrol for stationary work. They were fitted with H.T. magneto and were successfully used by many contractors installing private house lighting sets, and it was in this connection that I became acquainted with them; they were a good job. The "H" were horizontal oil engines ranging from about 10 to 50 h.p., and had compressed air starting, the air being compressed by manipulating valves when shutting down, the engine thus compressing its own starting air. These engines also had renewable cylinder liners. The "CR" was a high-speed petrol engine intended for marine work.

Continued on page 220



DARBY-SAVAGE DIGGING ENGINE

by Colin Tyler

Part XI

From page 108

INTERPRETATION OF SOME of the dimensions of the original drawings of the digger were not without problems and the wheels proved to be no exception.

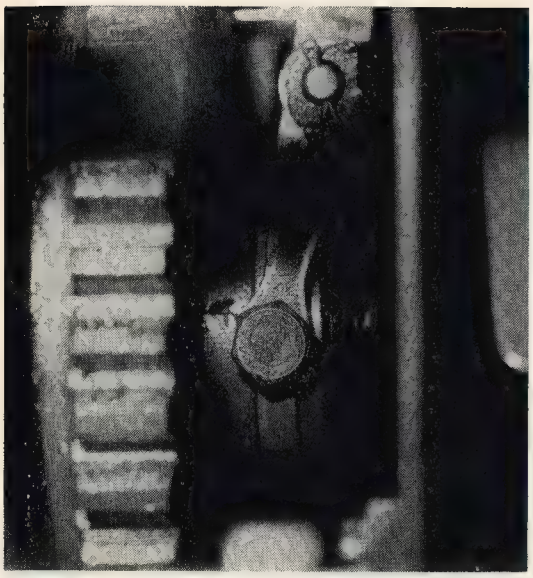
Construction of the main wheels—of which two are required—is considerably quicker than "traditionally" constructed traction engine wheels, being mainly of cast construction.

As shown on the drawing illustrated here, the wheels are the consequence of many hours of deliberation as to the accuracy of the model compared with the original engine. Photographically there is little evidence to give information from the sole surviving photograph of the 6 h.p. digger in Article I of this series, therefore reliance has to be on the original works drawings. Unfortunately these contain conflicting information which throws some doubt as to the working of certain parts.

A "dead" axle extends the full length of the double-ended boiler passing through flanged bearings which are attached to each of the four mainplates. Between the outer compartments of the mainplates are situated the wheels, drive gears and clutch. The drawing shows that the final drive gears are themselves driven by two smaller spur gears which are located on and keyed to a subshaft which passes underneath the water tank between the two inner mainplates. This shaft is mounted in two split and capped bearings similar to the crankshaft. To allow the large bevel gear to clear all obstructions in revolving, it is necessary to modify one of the corners of the water tank by cutting the corner out, inverting it into the tank and resoldering in.

Underneath the cylinder end of the boiler, located within the final drive gear, is the dog clutch operated by a long lever which extends from the clutch to a position adjacent to the coal bunker within reach of the manstand—although to operate this lever the driver was obliged to lean over the bevel gears on the top end of the near vertical shaft which provides drive to the main axle. It is possible that a safety guard was provided at this point although there is no evidence to support this theory, leaving one wondering just why it was that no accidents appear to have been reported in connection with digging engines.

There is no doubt that a digging engine as produced nearly one hundred years ago would today be regarded as something of a safety inspector's nightmare! Just why Victorian engineers paid scant regard for even elementary forms of safety devices—for example gear guards—which today is regarded as normal practice is something of a



Main wheels, clutch lever and clutch engaged through final drive gear.

mystery. I can only conclude that the principle is similar to the Continental practice of having rail coach windows which can be opened so wide that it is comparatively easy to fall out. However, no one does (or at least no one seems to!) as the danger is obvious. Perhaps gears are equally obvious as danger points. It may be that modern design practice to some extent produces machinery that is inherently safer in that gears are now so much reduced in size for the same power transmission requirements as a century ago that they can now be incorporated within the confines of a gearbox out of harm's way. It would seem that reliance was placed in the commonsense of the driver or operator of any type of machine—the general policy seemingly saying that if they happened to get caught up in the machinery it was their own lookout, and anyway, there were plenty more operators available! As a system it must have worked with some considerable degree of efficiency as the number of reports of accidents—some of which were quite dreadful—is not as large as might be expected and often were the result of deliberate tampering with safety valves, and overloading the engines in excess of the work for which they were designed. Another cause of accidents was the false economy of not replacing worn parts. When cables frayed, gear teeth wore thin or bearings were not lubricated, it was then that trouble started, and one sometimes suspects that it was not always the fault of the driver, but indirectly the farmer or engine owner who caused the accidents.

Returning to our scale model Darby Digger and the wheels, it will be seen that from the way in which the wheels, clutch and axles are assembled, when the clutch lever is operated, either one or both wheels are being driven from the sub-shaft under the water tank. However, at no time are *both* wheels out of gear. Savage's original drawings show a well-drawn half view of the engine with one wheel and clutch detailed in section, all nicely colour washed. Unfortunately the drawing omits to inform us whether a clutch was also incorporated in the other wheel or not, leaving one quite in the dark as to what was actually incorporated on the full-size engine. If two clutches *were* incorporated there would have been a grave danger of the engine running away should both of the clutches have been disengaged simultaneously leading one to surmise that one clutch was incorporated, leaving one wheel permanently in gear—a system which may have worked very well in the field, but is something of a disadvantage for the model as it is impossible to move it by wheeling it around. As the general design and heavy weight combines to make the digger one of the most awkward models to lift that I have known, I have designed a base board to stand the model on for display purposes and a transport trolley which enables the engine to be moved about with comparative ease when at an event. Both of these items will be described at a later date.

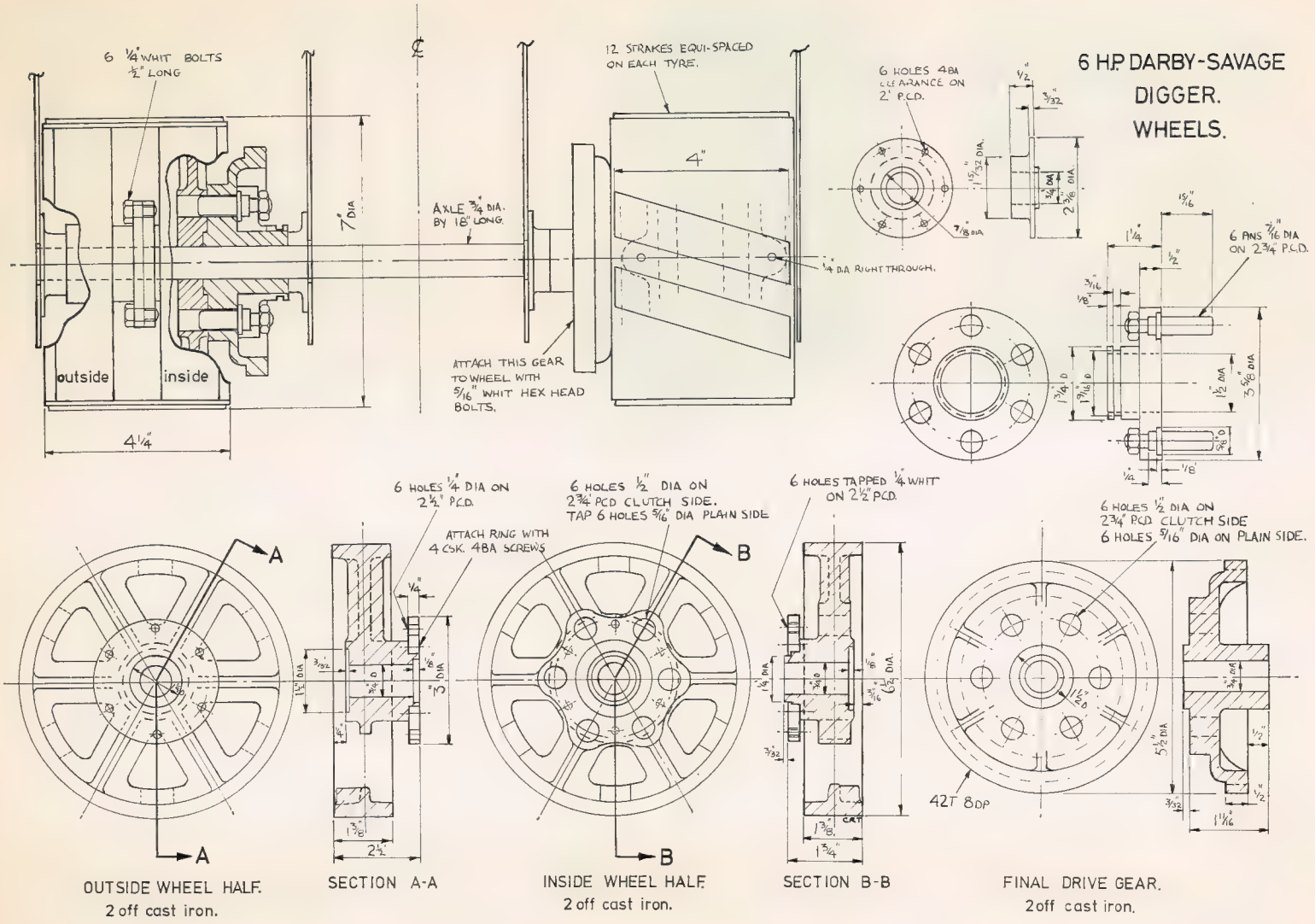
Making the land cart wheels was described in Article III of this series, while this article refers to the manufacture of the two main wheels and their associated gears, shafts and mountings.

Each main wheel consists of two iron castings which are located together by a tyre fitted tightly around them. The tyres form the width of the wheel and are equipped with twelve strakes riveted on to provide the grip so essential in enabling the digger to work efficiently.

The early trials of the scale digger took place in the very dry and dusty summer of 1976 in my back garden. The soil was in anything but good condition for cultivation by any means let alone the model. Nevertheless she was steamed and digging commenced. All proceeded well for a short space of time then, instead of gently inching forward leaving a dug swathe behind, the forks flailed in and out of the ground, while the wheels simply revolved in the sandy, dry soil. The engine meanwhile, gradually and gracefully proceeded to disappear downwards! This rather unfortunate occurrence was improved at a later date, when trials were made on a firmer, moister soil when a good performance was given and the wheel strakes bit into the soil sufficiently to propel the engine along.

One of the problems associated with working scale engines is the fact that while an engine may

6 H.P DARBY-SAVAGE DIGGER. WHEELS.



OUTSIDE WHEEL HALF.
2 off cast iron.

SECTION A-A

INSIDE WHEEL HALF
2 off cast iron.

SECTION B-B

FINAL DRIVE GEAR.
2off cast iron.

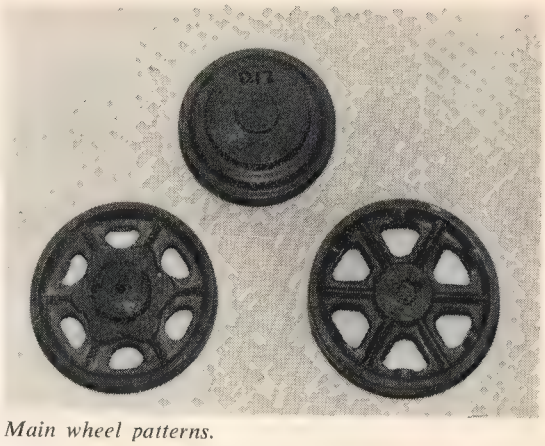
be constructed to scale size, it is impossible for the weight to be to scale as well. This also applies in some degree to the power/weight ratio. In the scale to which John Haining and I have constructed all our engines—that is $\frac{1}{6}$ of full size—the power is adequate even from the digger's single cylinder, through the enormous gear train. But owing to the comparatively light weight, there is a limit at which the wheels spin, which is nowhere near the limit of the power available, thus, to a certain extent it is not possible to use the engine to its best advantage. One way to minimise this is to have as near a "scale" soil as possible. This was attempted with the digger in the studios of B.B.C. television when the engine was demonstrated on Blue Peter. A studio set containing fresh cut turves (cut by one of the studio staff on the way to work early one frosty morning, no doubt leaving a bare patch in some unfortunate farmer's field!) was constructed in the studio. Unfortunately the tough stringy roots of the turf proved too much for the digger's forks and she refused to budge. It was decided to replace some of the turves with peat which I had taken with me for use if needed. This proved to be too soft for actual digging, but gave an acceptable appearance which sufficed for the programme. I suspect that the ideal soil for a scale digging engine does not exist, but further experiments will no doubt produce one which gives good results.

The two wheel patterns are made from pine—as indeed are most of the 75 patterns for this engine —turned from suitably thick blocks band-sawn previously to approximate shape. The cruciform spokes were formed by turning the centre section to a thickness of $\frac{1}{4}$ in. and then six triangular-shaped holes were sawn out, and separate webs made for each spoke from $\frac{1}{4}$ in. plywood. These were then bonded to the wheel with epoxy resin giving the required cross section. Bosses made from dowel were then bonded inside the rim for the spud bolt holes. Five further bosses were added to the centre boss of the inner half wheel in a similar fashion, for the final drive gear bolt holes.

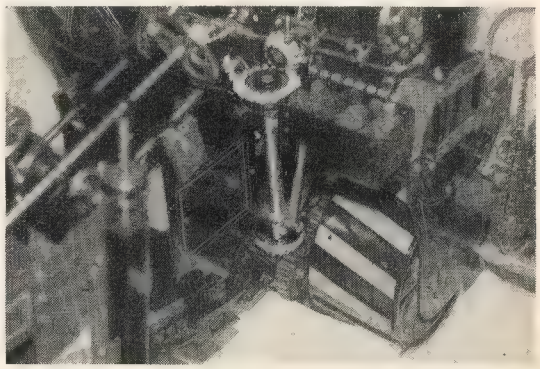
Wheels and any other part of the engine which could be cast saved much time compared with manufacture of the usual type of traction engine wheel, indeed the production of strong wheels cheaply was one of Savage's principle objects which he applied to most if not all the engines and tackle which emerged from St. Nicholas works in King's Lynn. From the model engineer's point of view it is a great boon. Unfortunately the appearance of the digger wheels is somewhat affected by the end main plates covering most of the wheel area, leaving only the rims visible.

Turning the wheel castings is just within the capacity of the $3\frac{1}{2}$ in. height of a Myford. Clamp each casting to the face plate by means of bolts. Pack the casting away from the face plate by $\frac{1}{8}$ in. so that a complete cut may be taken right across the outside diameter, incidentally using middle speed back gear revolutions. The finished diameter is $6\frac{1}{2}$ in., taking care that each wheel half is as near as possible the same, simplifying fixing the tyre at a later stage. Bore each casting to $\frac{3}{4}$ in. dia. right through, remembering that the wheels revolve around a "dead" or static axle. Should the two halves of each wheel be out of alignment when assembled the wheel will grip the axle with resultant stiff rotation. I fell into this trap and overcame it by reaming the bore right through.

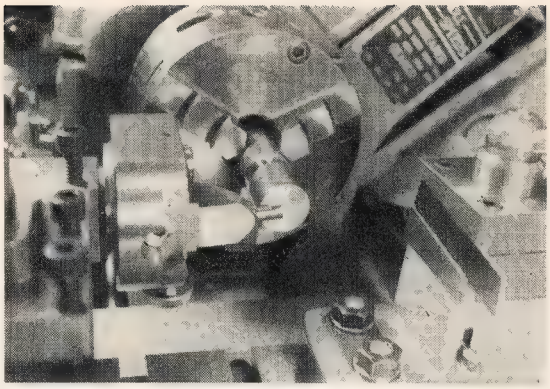
Drill the inner half of the clutch wheel $\frac{1}{2}$ in. dia. for the clutch pins and tap six holes $\frac{3}{8}$ in. Whitworth into the corresponding half of the second wheel for bolting of the final drive gear. Now drill and tap the holes $\frac{1}{4}$ in. in the wheel flanges as shown on the drawing, which enables the wheel halves to be bolted together. *To be continued*



Main wheel patterns.



This view shows the clutch lever near the coal bunker and vertical drive shaft to the main wheels. In the heading photo the effect of soft soil can be seen.



Three views of setting up the tool.

GEORGE THOMAS

Concludes his article on making

BALL HANDLES

Part II

From page 145

IT IS MOST IMPORTANT that, before attempting to turn a ball, all the material for the job in hand is made ready so that, once the tool is set up, all the ball-turning can proceed without interruption. If, for instance, four handles were required having 3/4 in. large and 9/16 small balls, I would prepare two pieces of 9/16 in. material about five to six inches long, face the two ends carefully and turn a groove 5/16 in. wide at both ends of each as shown in Fig. 2.6 and the photo. Four pieces of $\frac{3}{4}$ in. dia. would be required with the groove near one end and a centre in the other. In the case of quite small handles it might be necessary, owing to the overhang required for ball-turning, to leave the material over-length and cut-off and centre-drill after the ball-turning has been completed.

Setting Up

Put the work in the chuck with about $1\frac{1}{2}$ in. to $1\frac{5}{8}$ in. standing out from the jaws. Wind down the tool until it will just touch the rotating work when it is fed back and forth across the top. Note, it is necessary to have the work standing out at least $1\frac{1}{2}$ in. otherwise the bottom end of the tool-slide will foul the chuck jaws when the tool is swung round to the right—away from the chuck.

2. Move the saddle away to the right and swing the tool down. Return saddle to the left until the tool touches the end of the work. Lock the saddle.
3. Feed in the cross-slide until the tool is just to the centre—*not* beyond. Set the cross-slide collar to zero and preferably lock the slide.
4. Wind tool out until it can be swung over the top, clearing the corner.
5. Now start to feed down, about one turn (.025 in.) of the screw for each pass over the top and end which will start to form the ball.
6. Carry on until the ball is fully formed and if a small pip is left at the centre, the cross-slide can be fed in a trifle until the tool removes it completely. Continue to feed the tool in until the required diameter is reached. This will be .010 in. to .015 in. below the nominal material size to suit your holders (see later). When the ball is nearing

completion, the tool feed will have been reduced to five, then two, one or, even, one-half a thou and I find that it helps to achieve a slow, steady motion of the handle by grasping it in both hands against the chest and swaying the body together with the handle. Use soluble oil and, with a good honed tool and a bit of leaded FCMS, one can obtain a finish that emery paper would spoil! After the first ball is completed it will be necessary to go through the above procedure for each subsequent ball but the cross-slide can be left locked.

My own method is to turn, first, all the large diameter ball ends, and then follow with the small ones, thus doing all the ball turning at one session. Following this we part-off all the small balls and then, holding them in the 9/16 in. holder in the S.C. chuck and set with the small stubs running true, very carefully turn away the stubs, centre-drill and drill to size. But first we need the ball holders which can be seen in various photos and in Fig. 2.5.

Holders

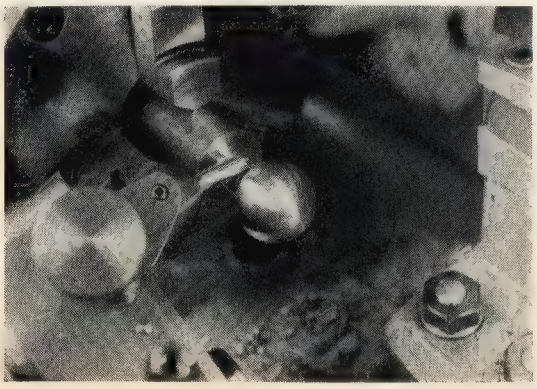
After a certain amount of experimenting I have settled on one holder which serves for any of the operations on a given size of ball. Fig. 2.5 shows a holder for a 1 in. ball and the dimensions for all sizes are tabulated below. D should be 10 to 15 thous below the nominal size and the actual dimension, to which the balls must always be made, should be stamped on the back of the holder. For those without adequate internal measuring gear it might be best to turn a ball first and use this as a gauge for making the holder to suit. F and G should be adhered to fairly closely because, together, they position the ball within the chuck jaws—1/16 in. from the end. Other dimensions are given as decimals because the micrometer collars on the lathe don't read out in fractions.

The holders can be made either of ordinary free-turning brass or M.S. My feeling is that M.S. is better in that it will take more pressure without deformation but, as pointed out below, there might be trouble if your alignments are not all that could be desired; if there is any doubt, use brass. Turn the exterior first and put in a drill somewhat smaller than dimension G. Part-off. Reverse in chuck and face off leaving small flange 1/16 in. thick. Mark a dot at the centre of jaw 1. Bore out the interior to dimensions D, G and F. Cut the slot opposite the dot and, to weaken the ring at the back, slit through in two places with an Eclipse Junior saw.

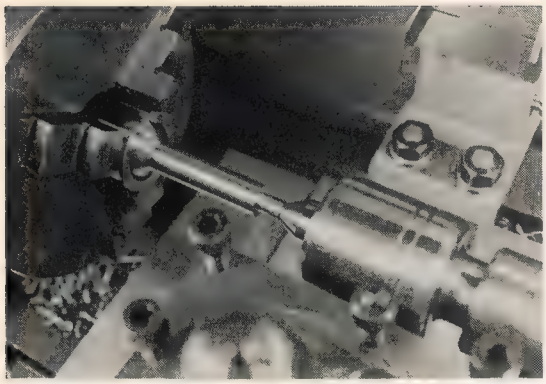
D	A	B	C	F	G
7/16	11/16	.59	.32	.290	.290
1/2	3/4	.65	.344	.313	.33
9/16	13/16	.71	.367	.336	.37
5/8	7/8	.78	.39	.359	.413
3/4	1	.91	.437	.406	.495
13/16	1 1/16	.97	.461	.43	.536
1	1 1/4	1.16	.531	.50	.66

Turning the Shanks

Next we must taper-turn the shanks and finish the stub-end to fit the small ball. Set up one of the shanks in the $\frac{3}{4}$ in. holder and bring up the tailstock centre before tightening the chuck. You should be quite sure that the tailstock is correctly aligned for turning dead parallel otherwise there will be a certain amount of "working" between



A ball partly and completely turned, below is a small ball, faced and drilled.



Above: Turning end of shank for small ball.
Top right: Turning the taper.
Bottom right: Taking out the radius.

the ball and the holder which, if it were made of M.S., would cause fretting or pitting in a ring around the ball. The same effect would, of course, be experienced if the headstock and tailstock were out of alignment in a vertical direction but there is little or nothing that can be done about this. The first job is to turn down the whole shank until it is only a trifle above the maximum diameter—where it joins the ball—and we then turn the stub on the end to a fairly close fit in the small ball. For this class of work a half-centre is the usual choice as it permits the tool to be run off the end; failing this, use a tool cut back at about 45° on the R/H side, leaving only a very short trailing end.

The turning of taper shanks usually presents difficulties due, mainly, to interference between the top-slide and the tailstock body. This has always been troublesome when turning M.T. shanks but it is a little worse when the diameters are smaller. If I had a number of handles to make I would use the taper-turning attachment which has been provided with a micrometer setting dial on which each graduation represents a slope of 1 in 10,000 (an angle of 20 seconds). In this case, the top-slide, being relieved of its taper-turning function, would be slewed round to put on feed as required and so avoid entanglement with the tailstock. When using a top-slide in this manner it is a good idea to set it to 30° which will give an infeed of exactly one-half of the travel. The T.T. attachment also permits the use of self-act feed but there is the disadvantage that, on many lathes, the feedscrew or nut has to be disconnected to permit free travel of the slide but I have a cure for this which I hope to fit and describe later.

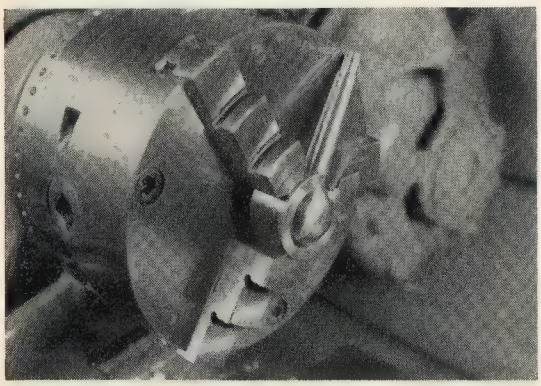
It will be found that, with the proportions given, the half-angle of the shank will lie between $1\frac{1}{4}°$ and 2° depending upon the length of the tapered portion in relation to the ball sizes—the sample which I made for the purposes of this article worked out at 1.76°. Start off with the top-slide setting on the full side—say 2°—and with a sharp, well-honed tool, start taking a few cuts along the taper but keep an eye on the small diameter at the R/H end. The taper will run out before the ball is reached even when the small end is almost down to size. This is the point that calls for some discretion when giving the top-slide a "nudge". For the first trial at the new setting, feed the tool in the reverse direction—from left to right—so that, if the angle has been set too fine, the cut will run out before the small end is reached whereas feed-

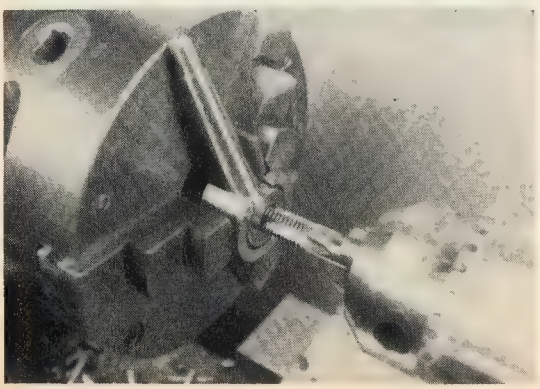
ing in the other direction would, in these circumstances, have reduced the large end of the shank below the intended diameter.

Another, and perhaps safer, way of setting the angle is to use the cross-slide to read differences at the two ends. In our example the small end is $\frac{1}{4}$ in. dia. and the large is 11/32 in., the difference being 3/32 in. which, halved, requires a run-out from the parallel of 3/64 in. (.046 in.) in the length of the shank. While the shank is still parallel set the top-slide over to the approximate angle and run the tool in by the cross-slide to touch the work at the extreme R/H end. Set dial to zero. Now run the top-slide along to the left and note the infeed required to touch the work at a point as near as possible to the ball. The amount by which the tool can be fed in should be .046 in.; if smaller, the angle is too small and vice versa. This method has the advantage that there is no danger of spoiling the work.

I find that on a Myford Super-7 lathe the point of the tool has to stand out about $1\frac{1}{8}$ in. from the square turret (it would be more in the case of the standard Myford turret) and while this would normally be regarded as excessive and very poor practice, in this particular case the duty is light and we can get away with it. I am aided somewhat by the more favourable position of the top-slide handle which, as can be seen in the photo, lies higher and further away from the tailstock body which helps to maintain a smooth rate of feed to the tool. Having obtained the correct setting for the top-slide, all tapers will be dealt with at one go.

Top: Handle in holder for facing and drilling.
Bottom: Running tap through. Note fibre packing.



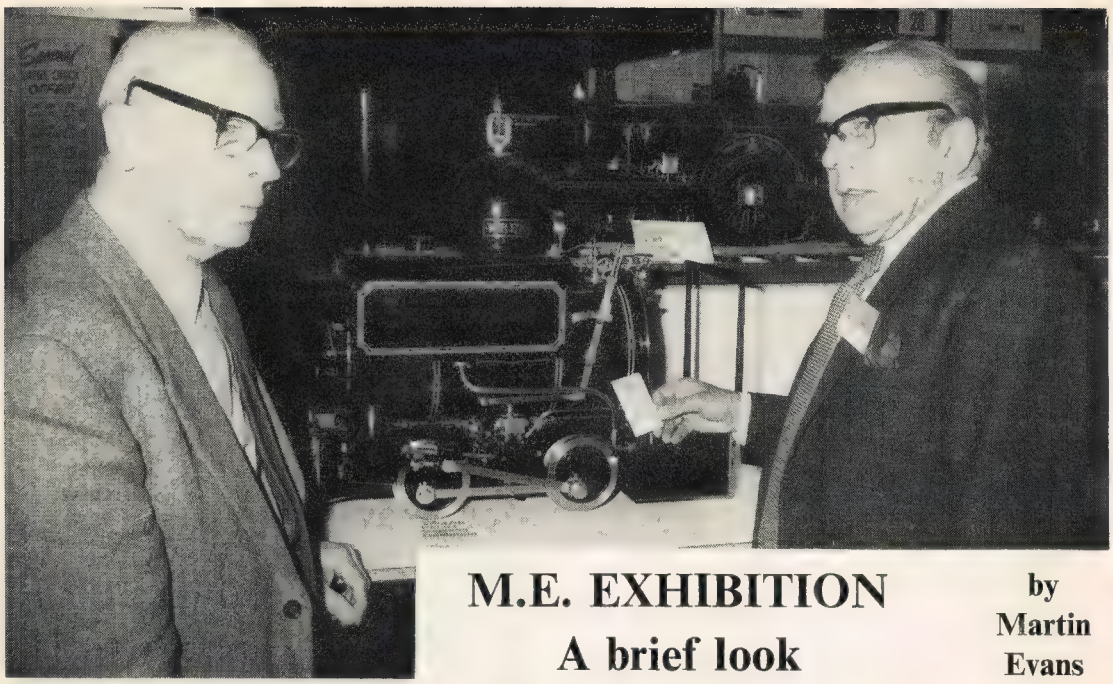


It now remains to turn the flat and drill and tap for the screw but before doing this there is one small matter which could be attended to if you are so inclined. I like the junction between the stem and the ball to be a sharply defined corner because I think that it looks better but those of my friends who are stress conscious prefer to see a small radius even though there is no stress worth talking about. In any case there is bound to be a sharp corner where the small ball joins the stem and another one at the root will be in keeping. Those in agreement will take out the radius left by the ball-turning tool by the careful use of a graver.

The holder which we have made and have just been using for the taper turning comes into use again and it provides complete location of the ball for our purposes. The tapered shank is slipped into the gap and turned backwards in the chuck until it contacts, via a piece of "softening", one of the chuck jaws. For this purpose I use a small piece of red fibre which can be seen clearly in the photo. With contact established and the end of the shank resting against the face or corner of the chuck body the chuck is finally tightened well. My own practice is to turn the ball back by an amount equal to one quarter of the ball diameter which will produce a circular face around the thread equal to $\frac{7}{8}$ of the ball diameter. While, for the purposes of drilling and tapping the hole, the workpiece is held positively, it must be realised that it still has one degree of freedom, viz. to rotate on its own axis; there is nothing but friction to prevent this so the turning away to form the flat should proceed with caution because this is the operation which can provide the necessary turning moment to precipitate disaster. Don't try to feed in with a knife tool; take shallow cuts across the face.

If the handle is to have blind-tapped holes, use second and plug taps, alternately if necessary, until sufficient depth has been reached but in the case of through holes use a taper tap and if it gets a bit too tight follow with a second and then return to the taper again.

The fixing of the small ball will depend on the fit provided, either press which is rather exacting or, if the fit is rather more free, it can be fastened with Loctite or Araldite after proper degreasing. Your handle is now complete and it should be provided with a proper seating which could be a thick, bevelled washer of diameter about equal to the large ball.



M.E. EXHIBITION
A brief look

by Martin Evans

THERE IS NO DOUBT that the 1978 Show was the biggest of its kind ever staged, though it must be admitted at the outset that this was mainly due to the huge number of entries in the Military Modelling sections. Nevertheless, all the "engineering" classes were well supported, and I was naturally pleased to see a good entry of steam locomotives this time.

Entering the foyer, the visitor was immediately confronted by all the models in the Duke of Edinburgh Trophy section—an excellent idea—and also by the tramway layout of the Tramway & Light Railway Society. The Duke of Edinburgh section was quite well supported this time, with eight entries which ranged from Mr. A. L. Pettett's magnificent Fowler Showman's Road Locomotive *Supreme* to a tiny miniature ship model by Mr. D. Hunnisett. I believe many visitors expected this coveted trophy to go to Mr. Pettett, but, surprise, surprise!—the winner was Mr. G. R. Michell of Ramsgate with his 1:256 scale motor vessel *Machaon,* of the Blue Funnel Line. The original ship was of 8530 gross tons and was built in 1959. Mr. Michell's model was a very fine piece of work, practically impossible to fault. In fact one really needed a magnifying glass to fully appreciate the fine detail.

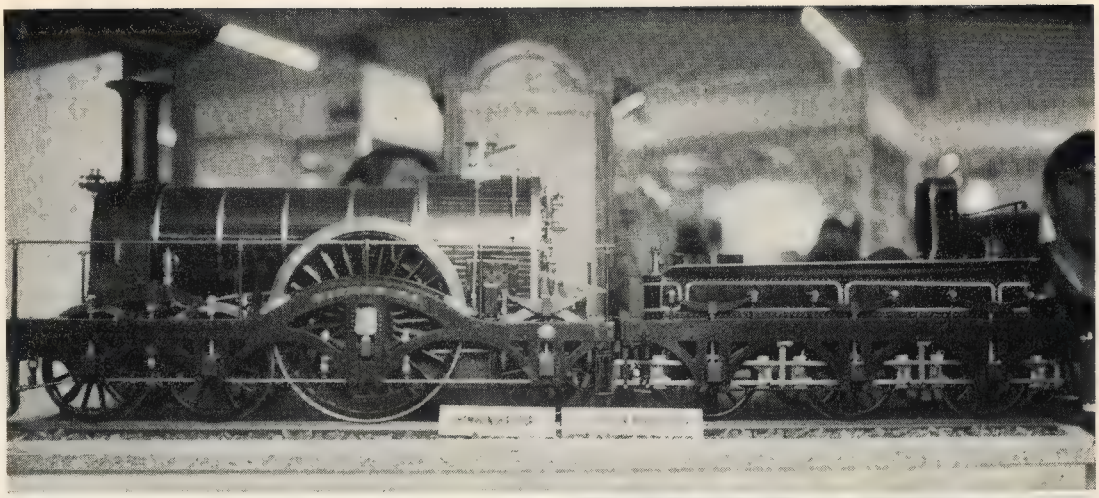
Runner-up for the Duke of Edinburgh Trophy was the Bellis & Morcom Triple Expansion Engine by G. E. Hartung of Gravesend.

One of the most impressive models in the Exhibition was also the work of Mr. Hartung. This was his entry in Class J—a model of the starboard engine and part of the hull of a Mississippi stern-wheeler, which took the Championship Cup in this class. The prototype engine was built by James Rees & Sons of Pittsburgh and had balanced poppet valves.

Also in Class J was a small but very interesting entry — a high-speed flash steam engine by Mr. W. A. Bowie of Ayr, which was awarded a Bronze Medal and also the Edgar Westbury Memorial Trophy. The description card on this model announced "steam engine", which was somewhat vague. I overheard one visitor remark that he thought the model was actually a petrol engine! It is to be hoped that the builder will favour us with a full description of this engine, as we see far too few of this type.

On to the steam locomotives now, and a very fine G.W.R. broad gauge "single" by R. M. Ordish of Blandford quickly caught my eye. This model was for 7¼ in. gauge and represented one of the 8-foot double-framed engines of 1847. The locomotive was very well detailed, complete with jacks and tools, and I particularly liked the neat riveting. The finish too was excellent, and the model well deserved the Championship Cup and also the Crebbin Memorial Trophy.

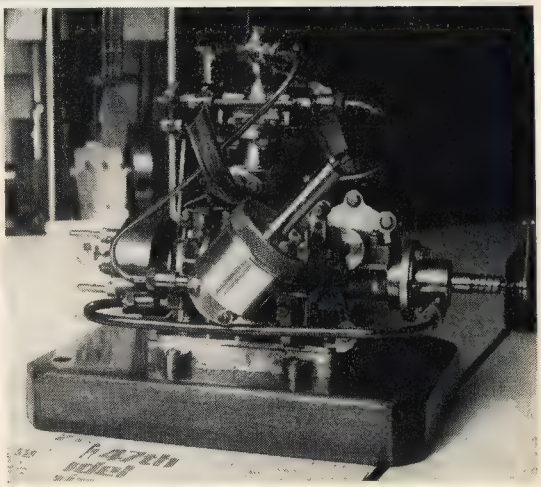
There were two 3½ in. gauge L.M.S. "Black fives", the ever popular Stanier mixed-traffic 4-6-0. That by Mr. I. E. Lewis of Solihull was a fine effort, having such accurate detail as correctly shaped cylinder cover glands, while both the rivet-



ing and the shape of the boiler mountings were beyond reproach. This engine gained a Silver Medal and the J. N. Maskelyne Memorial Trophy.

Other fine locomotives included a 5 in. gauge Lancashire & Yorkshire Railway 0-4-0 works shunter by Mr. G. J. Kimber. The prototype of this model was probably the smallest industrial type steam locomotive ever built, being for 18 in. gauge, and having cylinders only 5 in. x 6 in. A 3½ in. gauge L.M.S. 4-4-0 Compound by V. C. Gotrel of Solihull and a 5 in. gauge L.N.E.R. "Springbok" 4-6-0 by A. C. Hall of Feltham were among the winners. The L. & Y. engine and the Compound both gained Silver Medals, while the "B.I." was awarded a Bronze.

In the small railway models section, I was not surprised to see our old friend J. Brierley of Lancing gaining yet another Silver Medal and also the Model Railways Bowl and the H. C. Wheat Challenge Cup. His entry this time was a Gauge "O" Rebuilt "Merchant Navy" Pacific, fully detailed and with impeccable painting and lining. Among the small gauge rolling stock, I noted a 4 mm. scale G.W.R. "Macaw" rail wagon by Mr. R. Bennett of Denby. A very simple model, but remarkably realistic.



Chief judge, Arthur Smith, assisted by Peter Dupen, appears to be thinking hard about Mr. G. J. Kimber's "Wren".

Top: 1847 G.W.R. broad gauge 8 ft. single by R. M. Ordish.

Centre: Flash steam engine by W. A. Bowie.

Below: I. E. Lewis's Stanier Class 5.

"GREENE KING"

Martin Evans continues with the description of a 3½ in. gauge locomotive based on the Southern Railway S.15 class

Part X

From page 108

ONCE AGAIN, it is *Greene King*'s turn to take the limelight, and this time I think we must complete the valve gear, for we left off at the weighshaft and reversing arm.

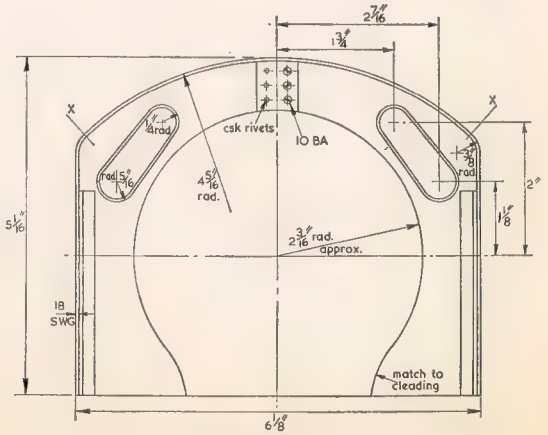
But before dealing with the reach rod and cab reversing gear, I must apologise for a mistake in the drawings of the bogie—to be exact, in the drawings of the equalisers. As drawn, they work out 3/32 in. too low in relation to the axleboxes and springs. Builders who have already made the equalisers can get out of trouble very easily by increasing the depth of the axlebox locating pins (at each end of the equalisers) from 3/32 in. to 3/16 in. But for those who have not yet made their equalisers, a better solution would be to increase the depth of the outer ends of the equalisers from 3/16 in. to 1/4 in., and add only 1/32 in. to the pins, this having the same effect, but making for a better proportioned equaliser. The ⅝ in. dimension between the top edge of the lower, middle, part of the equalisers and the top edge of the ends should be maintained, of course.

Back to the reach rod. I could give a definite dimension for the overall length, centre-to-centre, of this rod, but it is really much safer to make and fit the cab reverser, and measure "on the job". This is simply a matter of fixing the reversing arm exactly vertical, putting the reverser nut central, and measuring the distance between them.

The reach rod could be made from ¼ in. square material, but this would involve removing an enormous amount of metal just to achieve the forked end, and a much better way would be to make the rod in two pieces, a short piece of ¼ in. square to make the fork, and a length of ¼ in. x ⅛ in. for the other part, the two being joined by brazing. Before drilling the hole at the reverser end, the rod should be bent to shape and tapered off as shown. An additional short piece of steel of 1/4 in. x 3/32 in. section is then bolted on so as to embrace the reverser nut.

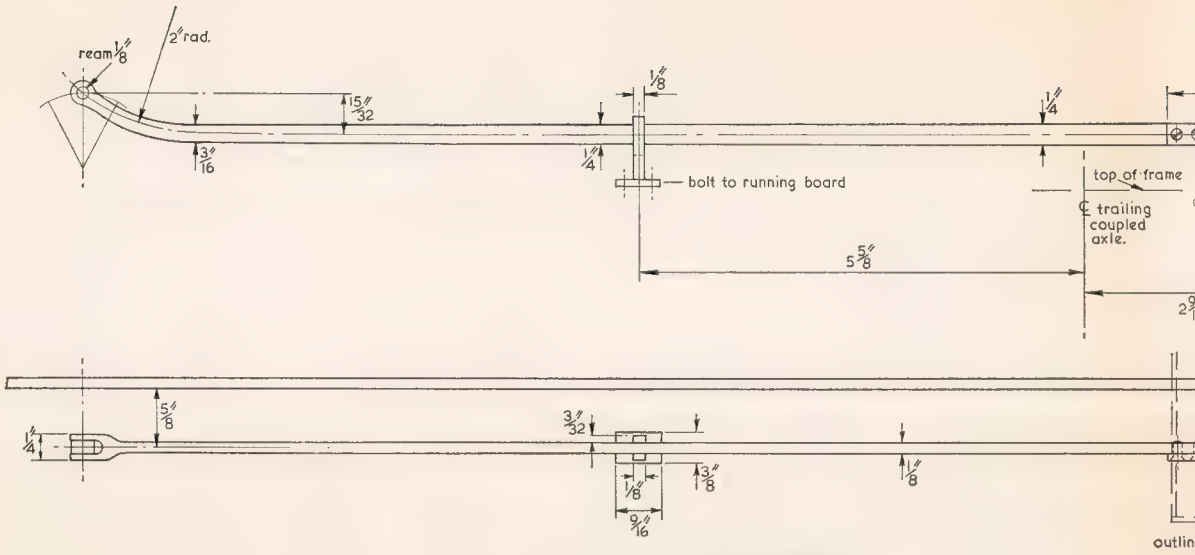
The reverser stand is cut from ⅛ in. b.m.s. and the two bearings are machined to size from cast or drawn gunmetal and reamed 1/4 in. x 5/32 in. dia. respectively. They are then slotted on their underside 1/8 in. wide and 3/32 in. deep, for fixing to the stand, to which they are brazed. It would be well worth while turning up a dummy screw, without the thread (that sounds a bit Irish I'm afraid, but builders will know what I mean!) so as to ensure that the two bearings are in line while being brazed. The stand is bolted to the left-hand frame, with its front vertical edge 2 9/16 in. to the rear of the trailing coupled axle, and the centre-line of the screw should be 1 5/16 in. above the top edge of the frame at its rear end.

With *Greene King*'s arrangement of valve gear, the reversing arm moves to the rear for forward gear, and forwards for backward gear! However, this is really a slight advantage for builders, as there is no need to make the reversing screw with the usual left-hand thread. If a right-hand thread is used, clockwise movement of the reversing wheel will put the engine in forward gear, which is the natural arrangement. Ordinary mild steel would do for the screw, though something a bit more sophisticated would give a longer life before wear sets in—perhaps one of the high-carbon steels or nickel-carbon steels may be available. The thread is standard ¼ in. Whitworth, which will give a reverse quick enough for use on continuous tracks.



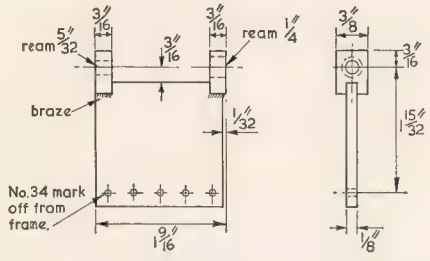
CAB & SPECTACLE PLATE

XX—sides & roof may be joined flush at these points. Spectacle plate —1/16" brass. Sides & roof—18 SWG

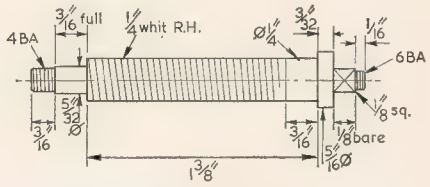


REACH ROD & CAB REVERSER

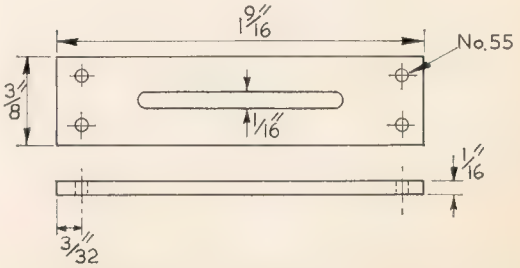
reach rod b.m.s. check length from job



CAB REVERSER STAND: b.m.s. bearing-gunmetal



REVERSER SCREW: steel (x2)



REVERSER INDICATOR PLATE: b.m.s. (x2)

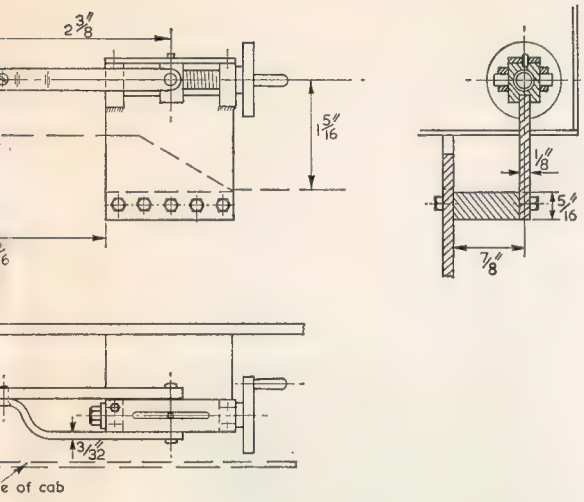
Those who like a quick-acting screw, or those who expect to use the locomotive mainly on short up-and-down tracks, would be well advised to have a go at a two-start thread.

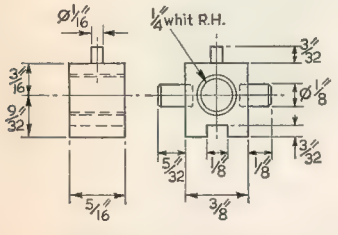
The reverser nut is cut from drawn gunmetal or phosphor-bronze. It is slotted on its underside 1/8 in. wide by 3/32 in. deep, so as to be guided by the top edge of the stand between the bearings. The nut is really too narrow to allow the pins which carry the reach rod to be merely pressed in with no other fixing, so perhaps they should be silver soldered in position. They are in any case made from drawn gunmetal, so as to avoid "steel-against-steel", so should present no problem, if a tiny "bead" of Easyflo is used. It will help if the holes in the nut for the pins are very lightly countersunk beforehand.

The top plate, which is held down on the bearings by four 12 BA screws (or 10 BA with 12 BA-size heads), is slotted out 1/16 in. wide, and the indicator pin in the top of the nut slides in this slot, to give the driver an approximate indication of the amount of the cut-off in use.

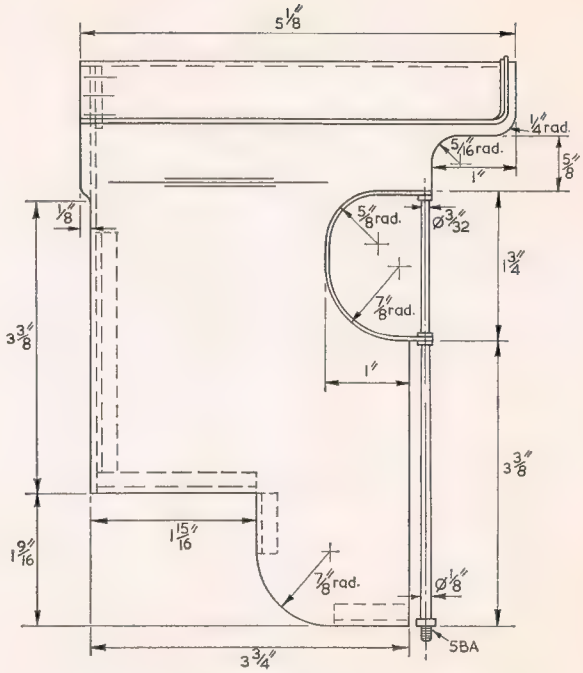
The handwheel is $\frac{7}{8}$ in. dia. and $\frac{1}{8}$ in. thick at the rim, it is four-spoked and is fitted on a $\frac{1}{8}$ in. square, with a thin 6BA nut to retain it. It could be made in mild or stainless steel as preferred. The shape of the full-size handwheel can be seen in the photograph on page 738 of 6 August issue 1971, for anyone fortunate enough to have a copy of that issue. The picture is actually of a "King Arthur" cab, but the backhead and cab details were similar on the S.15s.

The complete reverser is held to the frame with a spacer of mild steel which should measure





REVERSER NUT: gunmetal (x 2)
reach rod pins gunmetal — silver solder in position



CAB DETAILS

13/16 in. x 5/16 in. x just under 1 9/16 in. long. This could be cut from 1 in. x 5/16 in. section; rather a hefty chunk of metal but its weight will help adhesion!

Before passing the reverser for service, it is important to check that the movement of the nut is correct—not so much that the die-block fouls the ends of the curved slot in the expansion links at the full gear positions, not so little that the correct full gear positions are not reached or in other words that the ports are not opened fully in full forward or backward gear. Any over-travel can be cured by inserting a thin washer on each side of the nut, while under-travel can be corrected very easily by taking a skim off each end of the nut.

Before deciding on the layout of the backhead fittings, I thought I had better draw up the cab and spectacle plate, so here are the drawings of these items. At first sight, the cab sides and roof on the full-size engine appear to be made in one piece. Actually there is a break in the sides just below the point where the sides are bent inwards. One can see a double horizontal row of snaphead rivets here. But on our $\frac{3}{4}$ in. scale version, I think it will make for a much easier bending operation if we make the break where the small ($\frac{3}{8}$ in.) radius blends in to the roof proper, which is at 4 5/16 in. radius.

The spectacle plate will have to be made in two halves, with a joining piece on the top centre-line, otherwise it would not be possible to get it into position once the boiler had been mounted. It is cut from 1/16 in. hard brass, and the spectacles or lookout windows (what an unusual shape they are!) are edged on the inside with flat brass beading.

The cab sides are fixed to the spectacle plate by the usual $\frac{1}{4}$ in. brass angles and these are used again to hold the sides to the running boards, for which details later. The roof is almost bare of details, apart from the usual rain strip or gutter, for which we can use 3/32 in. brass angle soft soldered in place. *To be continued*

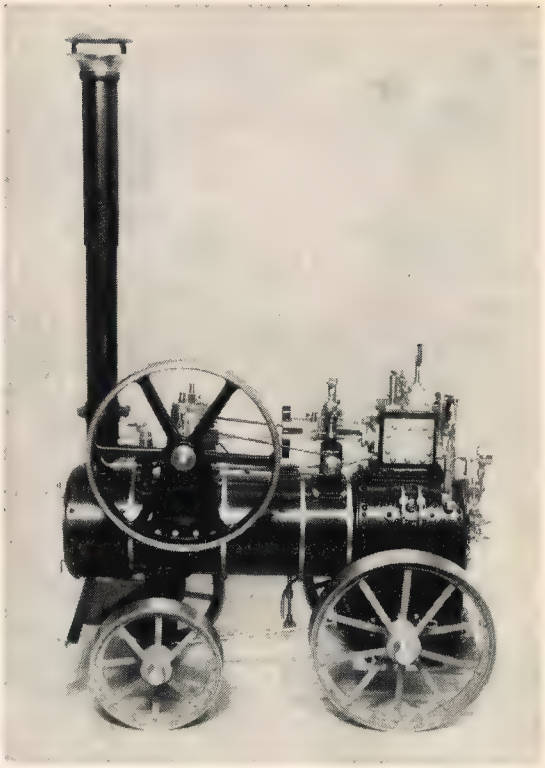
"GREENE KING" DRAWINGS

Sheet 5 of LO 950 is now available from M.A.P. Plans Service, price £1.10. Details include boiler, ashpan and grate, regulator, cab and spectacle plate.

THE MARSHALL PORTABLE ENGINE

by Ron Kibbey

Part IX *From page 77*



CONTINUING WITH THE crankshaft, my first advice is to caution patience in all stages of reducing this to its final sizes. An 8¼ in. bar 13/32 in. dia. would be very flexible between centres without the spring introduced by the crankpin gap and offset. The sharpest of tools and the finest of cuts and feeds are called for. When turning the main journal diameters a "gap piece" inserted between the crankpin webs and clamped in position as shown in Bill Hughes's article, p. 1156, 3 January 1975, will be most helpful. If using a fixed tailstock centre, apply only the minimum end thrust and keep it well lubricated but do not let it get slack—I have a running centre which comes into its own on a job like this.

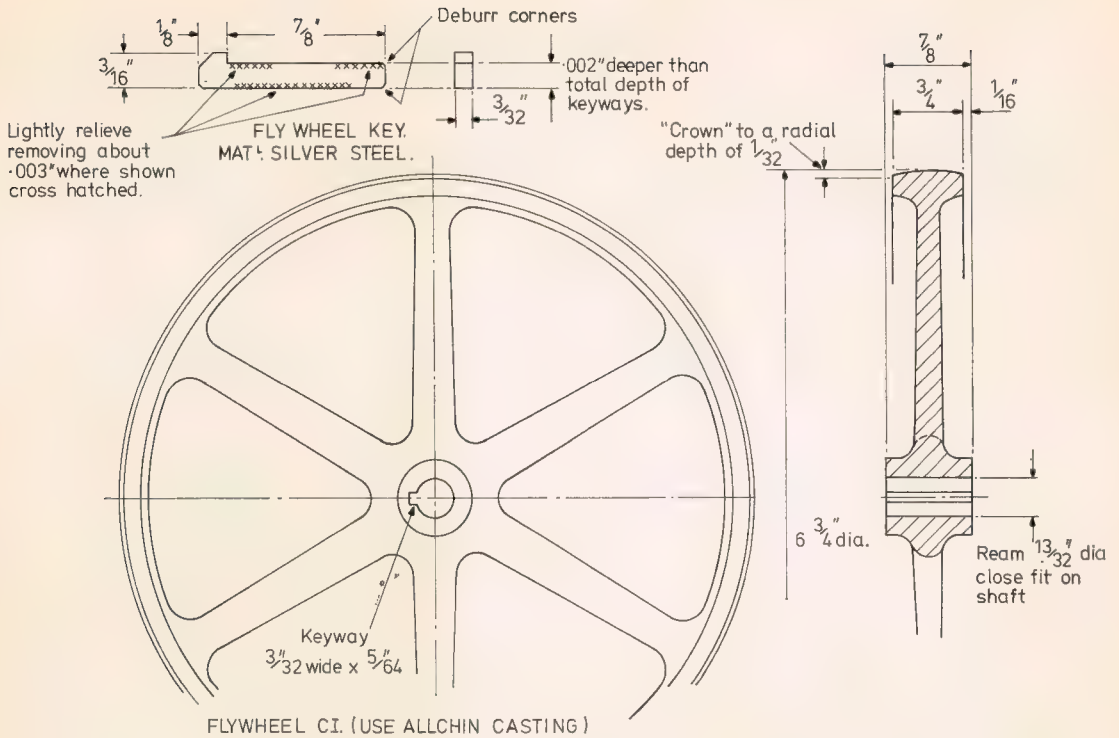
In order to ensure correct valve timing in either direction of rotation, it is important that the keyway for the reversing plate location is machined at 90° to the crank centre line. I cut my keyways using a 3/32 in. dia. end mill running at top speed of the Super 7. Those builders limited to speeds below 2000 r.p.m. might very well cut these keyways with a Woodruff. Since we shall be making our own keys, the fact that an end mill will cut a groove in excess of its nominal diameter does not matter.

The general plan of campaign now is to cover the remaining parts fitted to the crankshaft and to follow these with the outstanding cylinder covers, slide bars, motion bracket, and governor bracket. This will enable the erection of cylinders and motion on the part finished boiler shell to proceed.

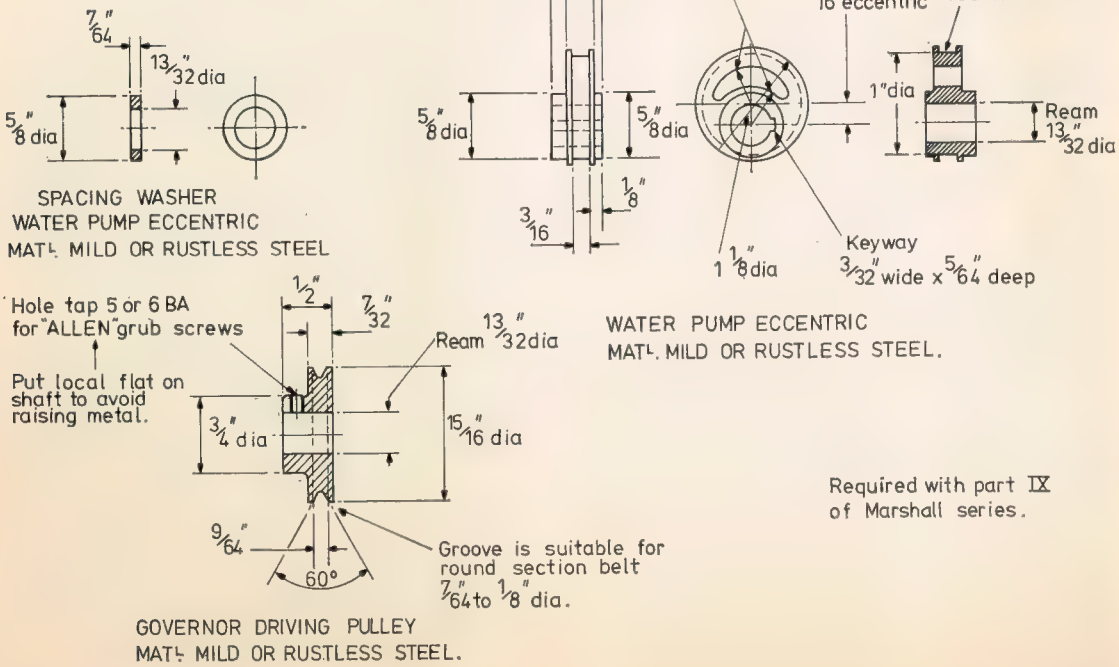
Machining the flywheel is more or less straightforward. The iron casting used on the Hughes Allchin is required. The important requirement here is that, when fitted to the crankshaft, it runs true without noticeable side wobble. With a relatively large wheel on such a small diameter shaft, very little out of truth at the bore is needed to produce an unacceptable wobble at the rim. The keyway in the bore is machined by slotting in the lathe with a cutter secured in a piece of ⅜ in. dia. bar. Bill used the method in his last article for machining the reversing plate keyway and referred to his Allchin article in *M.E.* 7 September 1973.

Referring to my drawing of the gib key for securing the flywheel, it will be seen that I have proposed relieving the outside of the key at both ends and the inside of the key in the middle. This will ensure that, when the key is fitted with a very light drive, the radial pressure from the key will be in the middle of the flywheel keyway and will not tend to create a wobble, which might very well be caused by a tapered key. A key fitted this way is also easier to withdraw when removing the wheel than one jammed in on a slow taper.

The water pump eccentric is a straightforward piece to make, and one is tempted to omit the crescent-shaped hole, as not being functionally necessary. However, it certainly enhances the part which is in a very noticeable position on the



FLYWHEEL CI. (USE ALLCHIN CASTING)

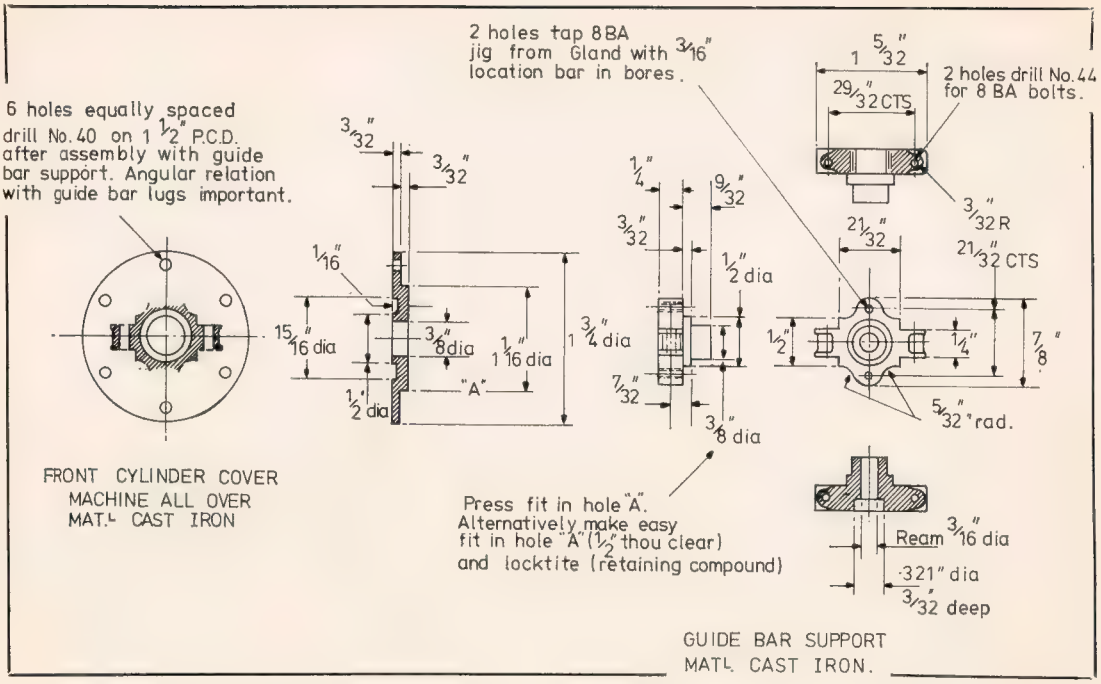


SPACING WASHER
WATER PUMP ECCENTRIC
MATL MILD OR RUSTLESS STEEL

WATER PUMP ECCENTRIC
MATL. MILD OR RUSTLESS STEEL.

GOVERNOR DRIVING PULLEY
MATL MILD OR RUSTLESS STEEL.

Required with part IX of Marshall series.



finished engine and certainly appeared on the full-scale engines. It is, perhaps, worth drawing attention to the importance of the truth and finish of the outer bearing surface, getting a good fit of the eccentric strap on this diameter can be most frustrating if the journal is not parallel right to the corners, since every try at fitting means the splitting and re-bolting of the strap. The slot in the bore is produced in the same way as for the flywheel, a shorter gib key being required.

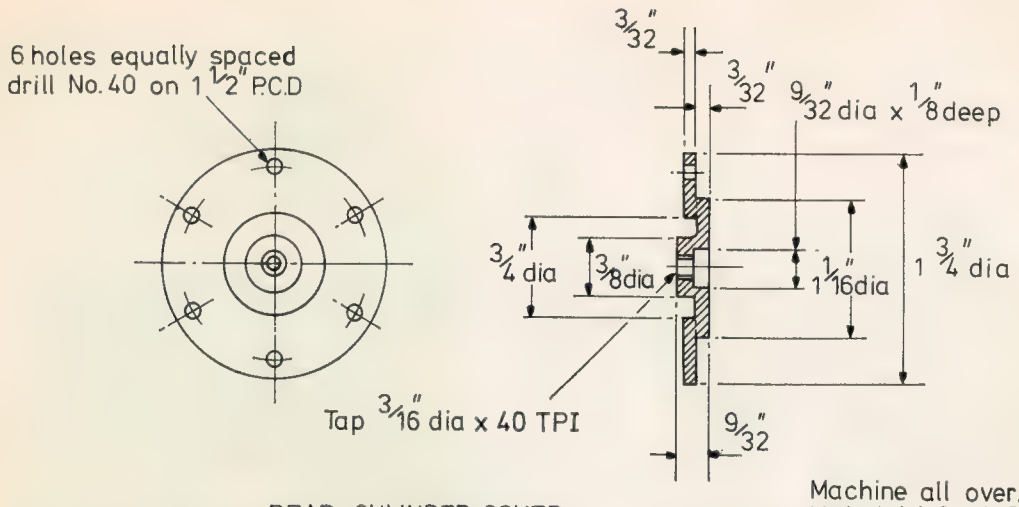
The governor driving pulley requires no comment. The groove for the belt is shown to the dimensions I used on my engine and suits a hard elastomer "O" ring of about .100 in. cross section diameter. It is secured by a small 5 or 6 BA grub screw, and therefore a small local flat will be required on the crankshaft journal, to avoid raising metal.

The cylinder covers are machined all over from castings which are now available in iron at Reeves, also the guide bar support piece which forms part of the front cover. At the time I built my Marshall, these castings were not available, and I noted that they were intended to be in cast iron. I asked Bill, "Why iron for the covers?" and he said that they should be left unpainted and polished and would then be similar to the original engines. However, I made these from some scrap chunks of bronze, and achieved the appearance of ferrous metal by painting with Humbrol "steel finish" paint, which gives a remarkably good cast iron appearance.

The rear cylinder cover is quite straightforward and presents no unusual problems. The front cover is complicated by the "fabrication" with the guide bar support. I started out intending to machine the guide bar lugs on the support piece after this was secured to the cover, but finally decided that it was better to fully machine the support piece before fitting. In order to get a good purchase on the support for milling the lug faces, the casting has a chucking piece cast on the centre boss, which can be finally parted-off after all machining is completed. It is obviously most important when milling that the lug faces on each side are in line and that the guide bar side location faces are equally distant from the piston rod bore and the $\frac{3}{8}$ in. dia. boss. The "O" ring recess must also be concentric, but since all the important diameters can be produced without disturbing the part in the four-jaw this should easily be achieved. Suitable "O" rings for all the Marshall applications can be obtained from Model Engineering Services, Brockwell.

Bill's earlier articles referred to "pressing" the support piece into the front cover. I have become quite a Loctite addict and much prefer to make the parts a close clearance fit and, after scrupulous cleaning, use Loctite retaining compound.

After assembling by pressing in or by Loctite, the six holes for securing the cover to the cylinder block can be drilled in the correct angular relationship to the guide bar lugs, but do not tap the holes in the cylinder block at this stage. When we



REAR CYLINDER COVER

come to the positioning of the cylinder block and front guide bar bracket on the boiler shell it will be useful to have some "rotational" adjustment for accurate lining up which can be provided at this point.

In the next instalment it is intended to cover the guide bars, front motion bracket and the governor bracket in which is carried an outrigger bearing for the valve rod.

To be continued

CLUB DIARY

Dates should be sent at least five weeks before the event to ensure publication. Please state venue and time. While every care is taken, we cannot accept responsibility for errors.

FEBRUARY

15 Birmingham S.M.E.E. at Sheepcote Street. Jim Clements presents a steam miscellany from 12" to 10 mm to a foot.

16 The Nottingham Soc. of M.E.E. The use of 'Loctite' 7.30 p.m. at The Friends Meeting House, Clarendon St, Nottingham.

17 Romford M.E.C. Talk or Films. Ardleigh House Community Centre, Ardleigh Green Road, Hornchurch, Essex. 8 p.m.

17 Ickenham & District S.M.E. 8 p.m. Members slides. Rear of Coach and Horses, Ickenham.

19 Basingstoke & District M.E.S. Track construction.

20 City of Leeds S.M.E.E. "The Amateurs Lathe" a talk by Mr Cusworth.

20 N. Wales M.E.S. Meeting at Penrhyn New Hall, Penrhyn Bay, Llandudno. 7.30 p.m.

20 Clyde Shiplovers & M.M. Society. Cine films.

20 Worthing & District Soc. of M.E. History of Wireless. Mr R. A. Ham. Broadwater Parish Room. 7.30 p.m.

20 Wigan & District M.E.S. Meeting Co-operative Guild Room, Thompson Street, Whelley at 7.15 p.m.

21 Chesterfield & District M.E.S. "Tool & Cutter" Grinding by Prof. Chaddock at the Canteen of the Bryan Donkin Co., Derby Road, Chesterfield. 7.30 p.m.

22 Bradford M.E.S. Bruce Wright "B.R. Disasters". 7.30 p.m. Eccleshill Com. Centre.

22 Bristol S.M.E.E. British Rail Staff Assn. club. Temple Meads Station, Bristol. The "Essdee" spark machine.

22 Sutton Coldfield Railway Soc. 1959—a vintage year—M. Mensing. Slides.

22 Birmingham S.M.E. at Illshaw Heath. Bob Cooper gives an illustrated talk on the Bude Canal.

22 Exeter & District M. & Exp. Eng. Soc. AGM 7.30 p.m. Nurses Recreation Hut, Princess Elizabeth Orth. Hospital, Barrack Road, Exeter.

23/24/25/26 Florida Live Steamers & Railroaders Inc. Annual meeting biggest of year at 3000 ft. 7½" g. track (private) in Maitland, Florida, nr. Orlando.

23 Hull S.M.E. Lathe attachments to be brought by members.

23 S.M.E.E. "Carburation". Mr L. Reece visits us to describe his experiences with the mysterious internal combustion engine.

24 East Sussex Model Engineers. "Steam Cavalcade" illustrated talk by Peter Wilkins

24 Brighton & Hove Soc. Film show by L. Foster at Elm Grove School, Elm Grove, Brighton at 8 p.m.

24 The Thames Shiplovers & Ship Model Society. At Botolphs Church Hall, Bishopsgate EC2. London River—an illustrated talk by J. Bowen.

24 Kinver & West Midland S.M.E. Welding Gas and Electric Arc. 7.30 p.m.

24 The Nottingham Soc. of M.E.E. New Year Dinner 8 p.m. Victoria Hotel.

24 Ickenham & District S.M.E. Metro-land talk by D. Edwards. 8 p.m. at rear of Coach and Horses, Ickenham.

25 S.M.L.S. News Nosh Night.

25 Birmingham S.M.E.E. Illshaw Heath, Fancy Dress Party.

26 S.M.E.E. Visit National Maritime Museum Print Room.

26 Basingstoke & District M.E.S. Track construction.

26 N. London Soc. of M.E. Show of members slides.

27 Bedford M.E.S. Informal meeting loco building.

27 Willesden & West London S.M.E. Film Night. Kings Hall Community Centre, Harlesden Road, London, NW10. 8 p.m.

28 Basingstoke & District M.E.S. Talk —to be arranged.

28 Romney Marsh M.E.S. Talk by Tony Crohurst, Church Hall, New Romney 7.30 p.m.

28 Northampton Society of M.E. A.G.M. 8 p.m. at Kingsthorpe Comm. Centre, Mill Lane, Kingsthorpe, Northampton.

MARCH

1 Bradford M.E.S. AGM. 7.30 p.m. Eccleshill com. centre.

1 Sutton Coldfield Railway Society. Layout, test track and chit chat.

1 Guildford M.E.S. Mr Potter's films. 7.45 p.m. at HQ Stoke Park.

1 Cannock Chase M.E.S. Meeting Lea Hall club 7.30 p.m. Models in progress.

2 Leyland Preston & District S.M.E. Meeting at Roebuck Hotel, Leyland at 8 p.m.

2 S.M.E.E. Bits and pieces.

2 Warrington & District M.E.S. Bits and pieces night in Pavilion, Daresbury at 8 p.m.

2 High Wycombe M.E. club. Monthly meeting at Besseysbury Manor. 7.30 p.m.

2 N. Devon Soc. of M.E. C. V. Thompson, specialised railway film show.

3 Ickenham & District S.M.E. Trolley repairs. 8 p.m. at rear of Coach and Horses, Ickenham.

3 Dublin Soc. of Model & Ex. Eng. 'Experimental Boilers' L. F. Wilkinson, 8 p.m. in the Star of the Sea School, Sandymount, Dublin 4.

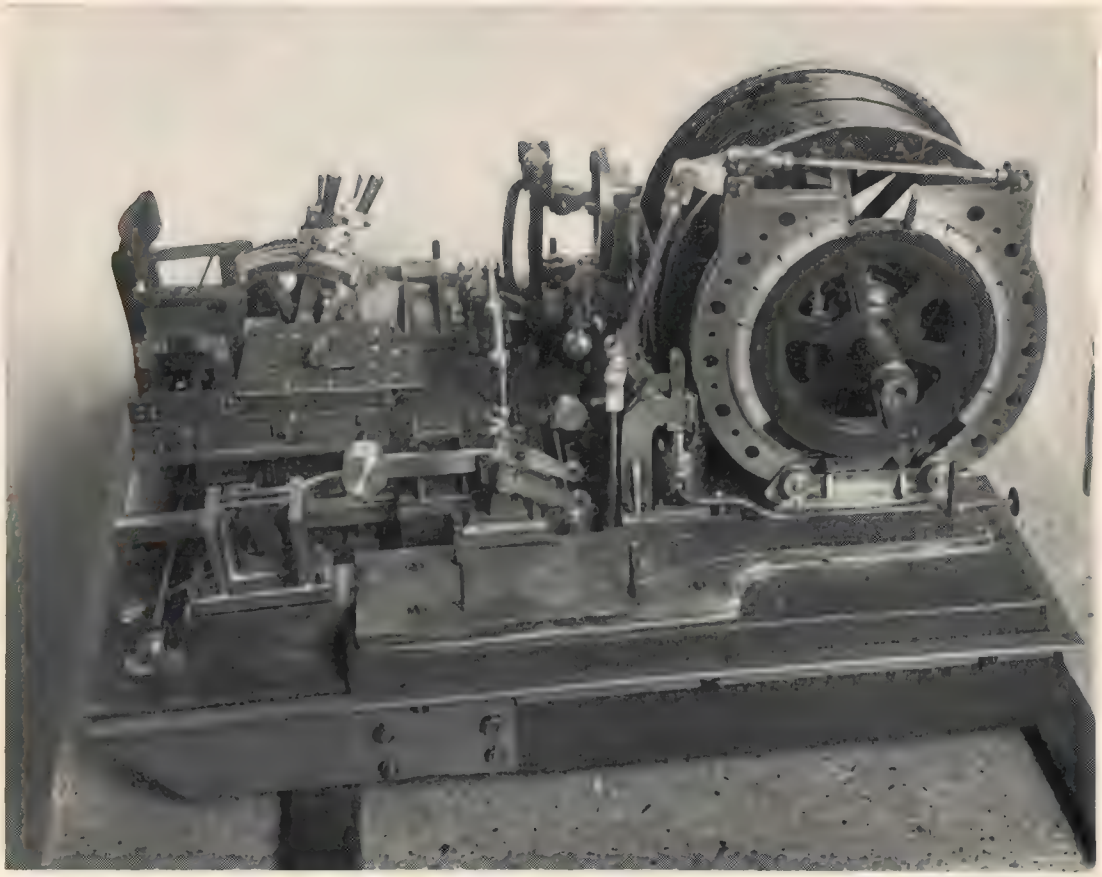
3 The Model Engineers Society. 7.30 p.m. Meeting in Cregagh Library, Cregagh Rd., Belfast.

3 Huddersfield Society of M.E. in the Highfield clubhouse. Speaker: Halifax Cine Club, Mr Longbottom and Members. Subject. Own Movie. Local History—comic film.

3 Gt. Western Society, 'Didcot, Newbury and Southampton Railway' by K. Robertson. 7.30 p.m. Room 101 Palmer Building, Reading University, Whiteknights Park, Reading.

3 Stockport & District S.M.E. Bits and Pieces. The Parish Hall, Church Street, Cheadle, Cheshire. 8 p.m.

3 Rochdale S.M.E.E. Technical college. General meeting.



HOLMSIDE and SOUTH MOOR COLLIERY

Part III

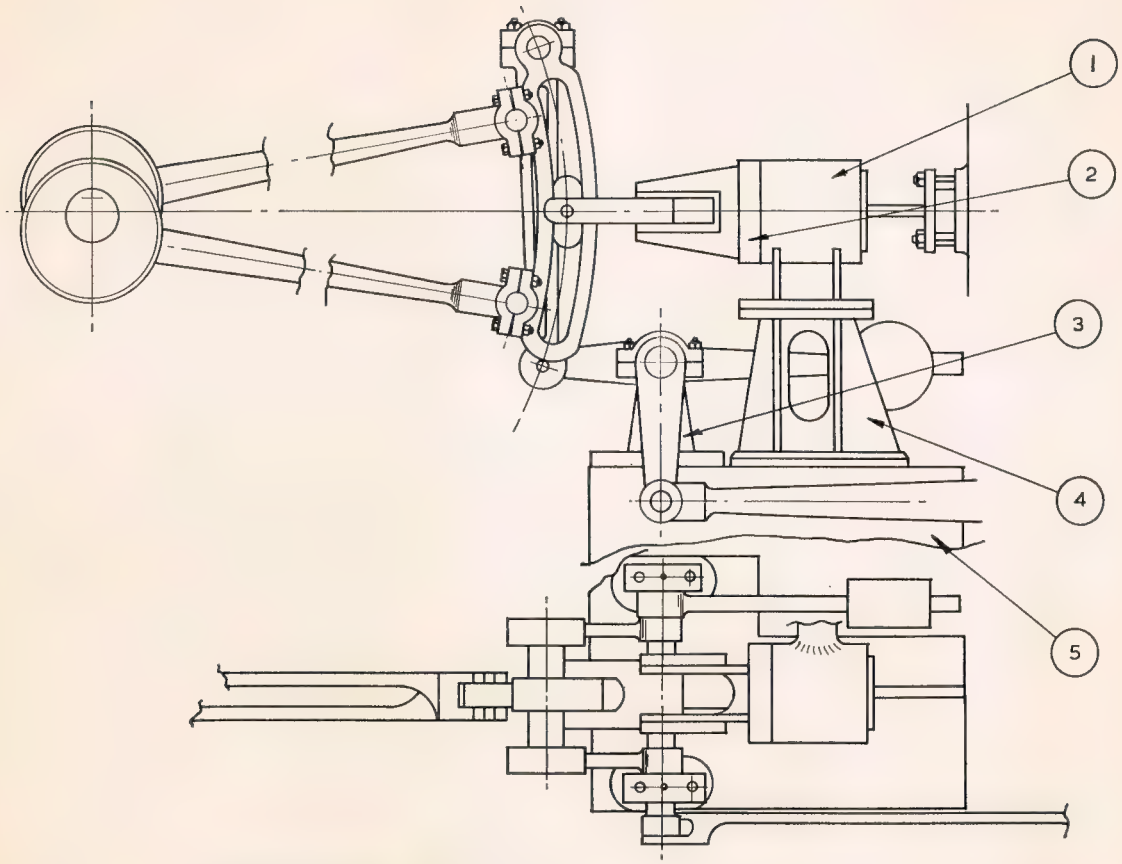
From page 81

by Ernest Cheeseman

I MENTIONED IN my article in *Model Engineer* for 16 September, that I would talk about the designing of the Stephenson link motion reversing gear, which was but another item deviating from the original design of the double Tangye engine, whose castings I was using. It was with tongue in cheek that I wrote this, for the major part of the designing had already been done by the late Edgar Westbury himself, notably the steam and exhaust port sizes, eccentric throws, valve travel, etc. All I had to do was to design an extra eccentric and expansion link, with its actuating linkage, and an enlarged valve spindle support to carry the extra weight of the additions.

To do this, I made out of cardboard the parts for one full reversing system, choosing for my scale, four times the finished model size. Using drawing-pins as axis and fulcrums, the mock-up was pinned to a wooden surface, and operated by hand; it then became a simple job of shifting the drawing-pins, until the correct valve spindle movement was obtained for the three critical gear positions, namely, Forward, Mid-Gear, and Reverse (X4); I might say here that winding engines were seldom "Notched Up". The size for the components, thus obtained, were then divided, so reducing hidden inaccuracies by the same amount. And that was the sum total of my designing.

Another little wangle will be needed for the actual D valve size, but that is another story.



1 SET R. HAND 1 SET L. HAND

Before leaving this subject, I would mention that no driver of a steam winding engine would leave it unattended without first bringing the reversing lever into the middle notch of the quadrant.

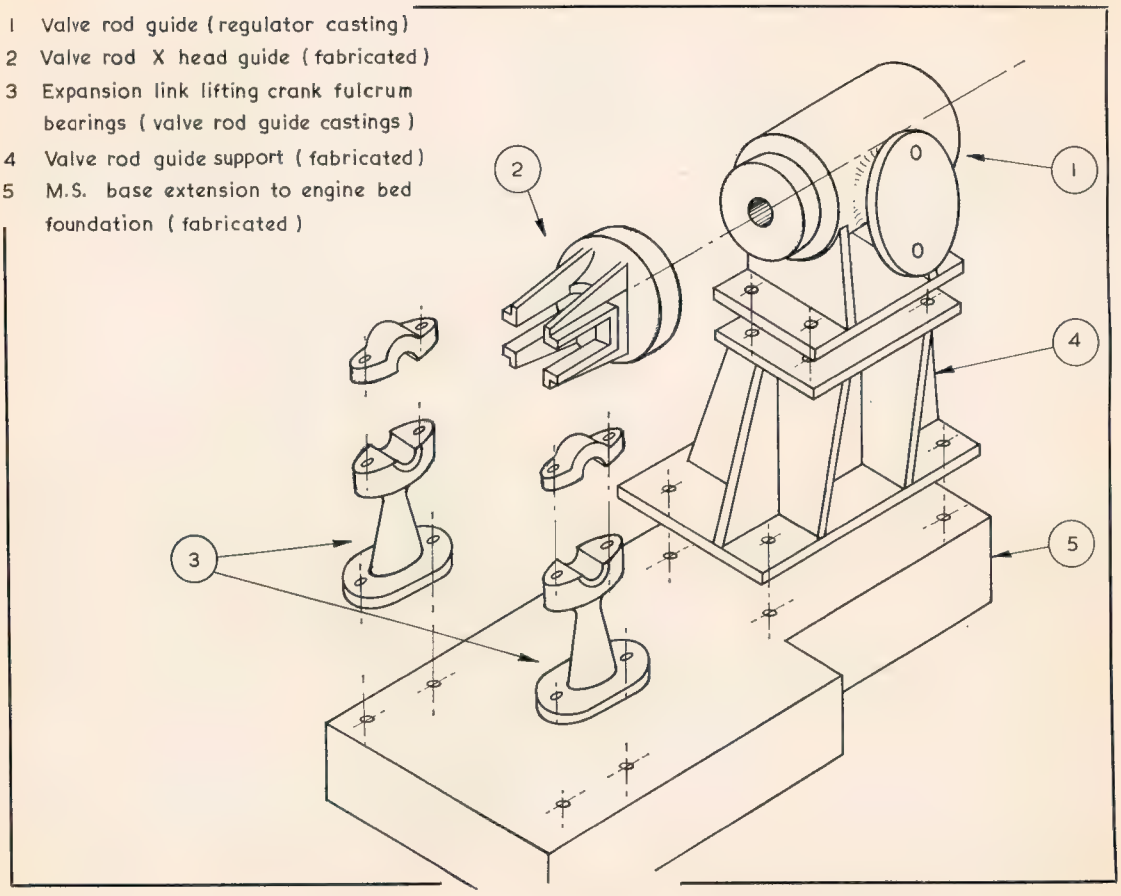
When faced with designing new valve-rod supports, I called upon memories of some 50 years ago, when on a number of occasions I inspected the winding engine, as unfortunately no records of any sort are now in existence. With the Double Tangye engine castings were two regulating valve body castings, which for my purpose were now surplus. These were altered and machined to become my new heavy duty valve spindle guides. The original valve spindle guides were now adapted to become the fulcrum bearings for the lifting links, and not yet being able to produce my own castings, I had to purchase two more for my purpose. An exploded sketch of the valve spindle guide support, and lifting link fulcrum bearings, is shown in the sketch, together with the extension to engine bedplate.

The oval flange, originally intended for the steam supply pipe, was faced and drilled for bolting to the raised boss on the crosshead guide, originally intended for item No. 20 in the original design. A small stool was made out of 18 s.w.g. sheet brass and was silver soldered into suitable slots cut into the underside of the valve spindle guide.

Item No. 2 was fabricated out of phosphor bronze, and the rear face bored out an interference fit for the spigot on Item 1, and soft soldered.

Item No. 4 was made from 18 and 16 s.w.g. sheet brass, and like all my other fabrications, all pieces were dovetailed together as far as possible, plus a spot of rivet hammer resulting in a strong and stable structure, especially where the dovetailed joints are really neat, thus greatly facilitating the subsequent silver soldering. The latter then gives a nice little radius to all corners, so that after painting, the item has the appearance of a genuine casting such as would have been used in the prototype.

Item No. 5 is a mild steel extension fitted to the original engine bedplate casting; the recess cut out of the bottom right-hand corner is to accommo-



date the expansion link counter balance. A plan and elevation of the whole assembly is also shown.

There are two independent braking systems, both acting on one set of brake shoes. The first is the normal operational set controlled entirely by the winding engine driver, and the second is an automatically operated system, initiated by "Over Speed" of the winding engine itself.

The normal system is governed by either hand lever or foot pedal situated at the driver's chair. Hand lever and foot pedal can be independently operated; the foot pedal is spring loaded, and returns to "Off" position as soon as the weight is removed from it, while the hand lever works in a quadrant: the quadrant assembly also accommodates the lever for reversing the engine, both these levers being independently fulcrummed on the same shaft. The reversing lever is fitted with a spring-loaded indent which in operation drops into forward, reverse, or mid-gear positions, there being notches cut for these. There is not much notching-up done on winding engines, it's full gear all the time. The brake lever has a spring-loaded pawl which, when pulled back, drops into the ratchet teeth (saw tooth shape), and holds the brake in the "On" position until released. Both the indent and the pawl have to be released by hand. The reversing lever is coupled to the weighshaft, and the brake levers are coupled to the brake assembly through the usual linkage of bell cranks and rods fitted with adjustment at the clevis ends.

The brake rods terminate at the "Stirrup" double-eye, an item not shown in Fig. 1 for clarity. This stirrup double-eye is fulcrummed on pivot "A" (Fig. 1) of the stirrup crank (marked No. 2). The stirrup crank, and the brake operating crank (No. 1) are separately pivoted on a common pivot pin "C".

As 2 descends the underside face of "D" of No. 2 contacts the top edge of No. 1 causing this to descend also. To pivot "B" is attached the brake operating rod clevis. The descending motion applies the brake. Note that at the same time the toe of the brake operating crank rises away from the brake cylinder's piston-rod head, leaving it at E.

At a predetermined r.p.m. of the winding engine

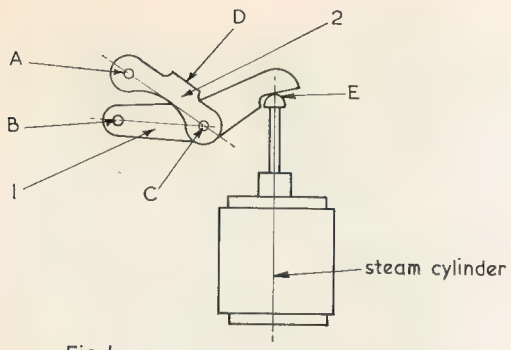


Fig. 1

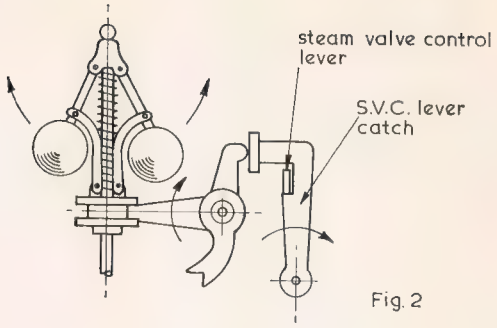


Fig. 2

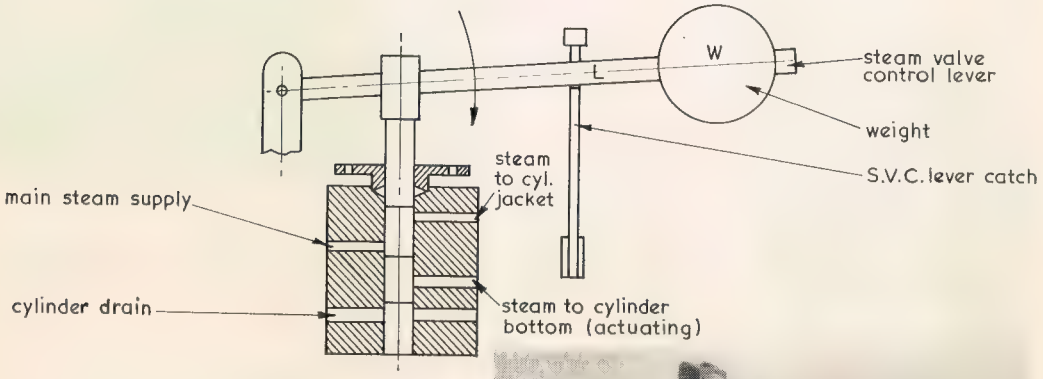


Fig. 3

BRAKE GEAR

the centrifugal outward motion of the governor balls causes the steam valve lever catch to disengage from the steam valve control lever, "L", and the weight, "W", causes the balanced steam valve to descend (see Figs. 2 and 3). Prior to this action, the valve was directing a constant flow of steam into the steam jacket of the cylinder to keep this at the proper operating temperature, this flow being controlled by a subsequent steam trap.

On tripping the lever, "L", steam is re-directed into the bottom of the cylinder, at the same time the drain from this cylinder is closed. The ascending piston motion is transferred to the brake operating crank at "E", causing "B" to descend, and applying the brake. Note that the stirrup crank is left in position, and no motion is transmitted back to foot pedal and handbrake lever. The ascending piston in the first part of its travel shuts off the steam to the winding engine (mechanism not shown in Figs.).

Points governing the design:

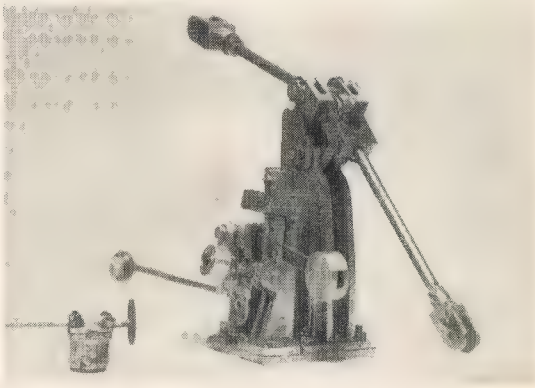
1. The energy available from the governor is insufficient to trip a heavily loaded lever catch associated with the "Dead Weight" braking system.

2. With the "Dead Weight" brake loading system out, the steam operating system is the only one available. (There were no electrics or hydraulics in the 1800s.)

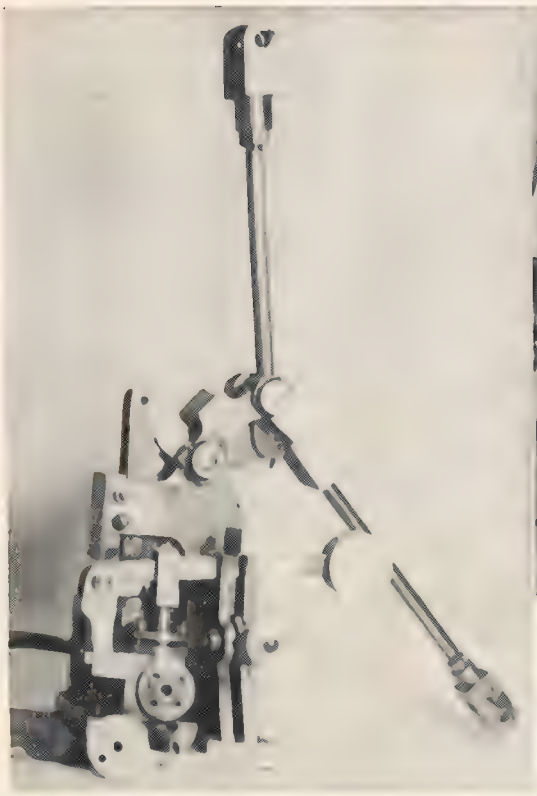
3. The steam cylinder must be kept at working temperature, hence the steam jacket and steam trap.

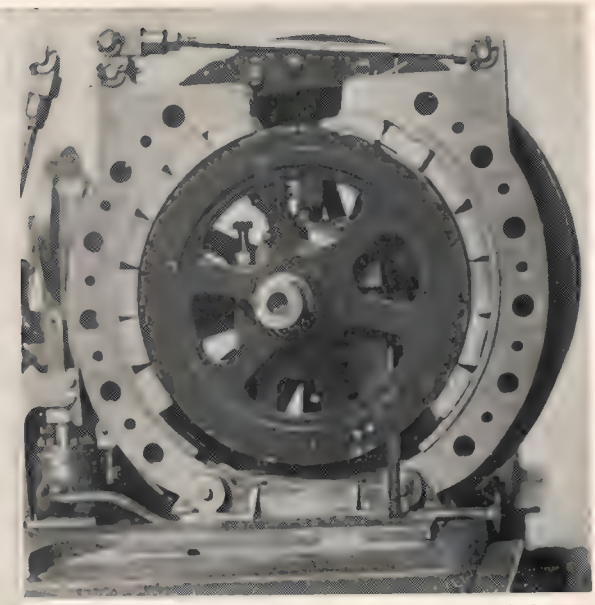
4. The cutting-off of steam to jacket when the cylinder is operating safeguards against reduction of vital steam pressure, should the steam trap "Fail Open".

5. The cylinder drain relieves trapped steam pressure when re-setting the system after trip.



View of the brake unit. Note steam trap.





Above: Close-up view of the brake drum and shoes.

Left: Valve chest side of automatic steam brake. Manual operation is through the same linkage.

To be continued

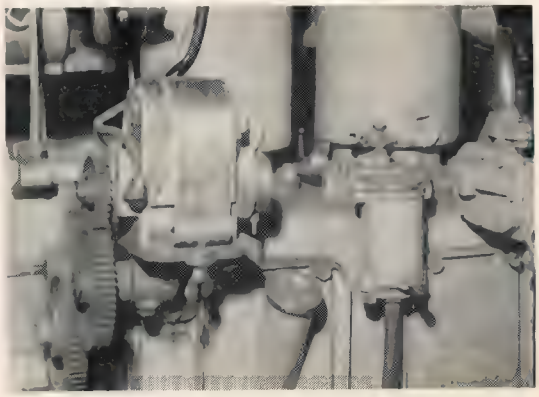
JEYNES' CORNER—

from page 198

In about 1913, a range of two-stroke semi-diesel engines appeared, the "T" and the "VT". These were not strictly compression ignition engines, as they had hot bulb as well as a patented injector. This engine was useful in marine work, as it could be reversed, by stopping, and starting up in the reverse direction. These engines were built with two, three, four, five, and six cylinders in the "T" type, the "VT" being a single cylinder engine.

In the period after the war the whole range of products were redesigned, and the Gardner engines of later years need no story, they speak for themselves.

In his letter Mr. Outram mentioned that Gardners supplied the first diesel engine to be used in a commercial vehicle: this was a 4L2 fitted in one of the Barton Transport Co.'s buses. Here was a coincidence in names, the name of Gardner's works being Barton Hall Engine Works. However, Mr. Outram could have also mentioned that the first Railcar diesel engine was a Gardner, also that the first diesel engine to be fitted into a private car was a Gardner. This was an LW engine fitted in 1931 to a Bentley car chassis. This combination



View of magneto drive—cover removed.

was entered in the 1933 Monte Carlo Rally and performed well. In 1935 another new experimental type of engine, the six cylinder LK, was fitted into a sports car chassis.

All these experiments resulted in many manufacturers of cars, buses and lorries fitting Gardner engines, a practice which has resulted in the Gardner engine being found from "Darkest Africa" to the "Poles" and set the seal of prosperity which exists today.

PART ONE

Photographs by courtesy of Len's of Sutton.

Fig. 1

BULLDOG/DUKEDOG

A 5 in. gauge loco described by Keith Wilson

IF EVER THERE WAS a poll on the most attractive locomotive, there would probably be more different votes than there were designs, for there were frequently variants within classes. It was almost traditional on the G.W.R. that there should be at least one "odd one out" in a class. The first Hall was a rebuilt Saint, and carried the name Saint Martin to the end of its days; I cannot be sure but I think it also had a structural difference. The "Castle" loco *North Star* had running boards a bit higher than all the rest; older readers may perchance remember *Earl Cawdor* which was certainly a good deal different from its parent "Badminton" class.

There is little doubt however that the G.W.R. 4-4-0s would have a high vote, and in my opinion the best lookers of this type were the Dukedog/Bulldogs. I mention these in one phrase, so to speak, for they had an interchangeable chassis (the Bulldogs were built out of the Dukes, later the "Dukedogs" were built out of some Bulldogs). Because of this great similarity (possibly greater than any other pair of classes) it would seem pointless to detail one design and not the other.

The early design in this style was the "Duke of Cornwall" class. Designed in 1895, the first 40 were completed by 1897. The earlier ones had wooden centres to tender and bogie wheels, and, later,

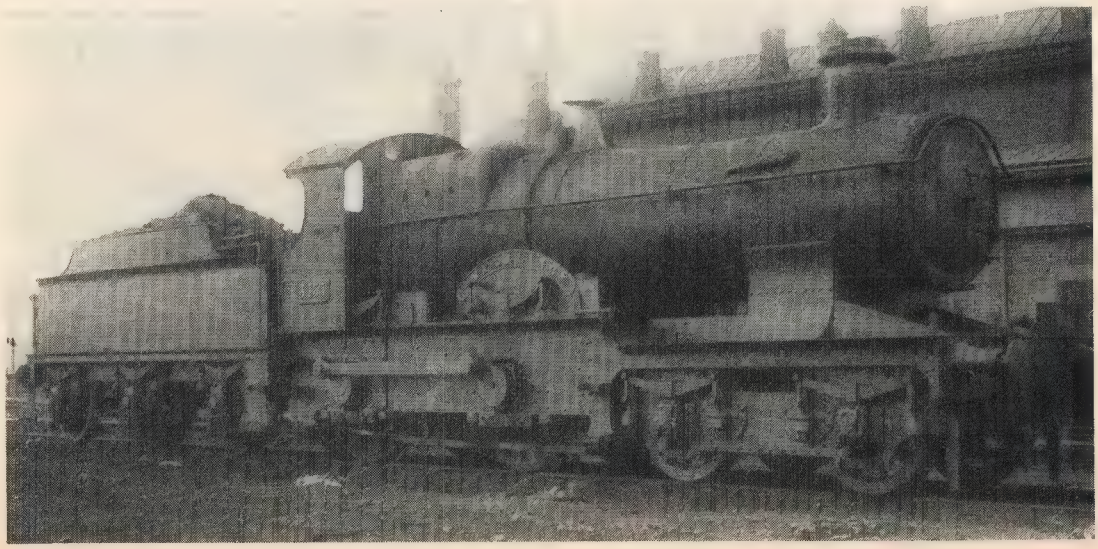
thicker tyres were put on the driving wheels to bring the diameter up to 5 ft. 8 in. (from 5 ft. 7½ in.); the cylinders were given longer ports and weight restriction easing meant that 2500-gallon tenders could replace the 2000-gallon ones provided. There were many other modifications, including some funny-business with names and numbers that I have not yet traced (at time of writing). For instance, 3265 *Tre Pol and Pen* had two totally different forms; I have photographs of it as a true "Duke" with wavy frames, and also with straight-topped frames and a different boiler and tender. The main odd thing here is that the wavy-frame version (presumably the earlier one) has the later top feed to the boiler, whereas the later one hasn't. It was no great thing for a swapping of names and numbers to take place (remember the *Windsor Castle* changeover with the post-war *Bristol Castle*?).

Perhaps the most significant change was in the locomotive *Bulldog*, hence the eventual class name for the 156 locos. There were no others exactly like her (or him?) but a new class arose. The early ones had Duke-type frames (I shall refer to them generally as Wavydogs); later somewhat stronger, straight-topped frames were used. The final form had straight-top frames, but with deeper frames at the bottom. They had delightful names (see below) but I feel that the deeper frame took away a little of the grace of these engines. The final two survived until 1951 (Skylark and Seagull, I think) and regretfully none were preserved. The names generally were from a wide selection, countries, counties, railway directors (even one with Wilson) and places as well as birds. The names of those corresponding to places however were soon removed; apparently it was impossible to convince passengers that a locomotive named *Reading* for example was not necessarily proceeding to that place! Some were not named, so there is great scope for whatever you may wish to call yours.

I was never fortunate enough to ride behind a Bulldog (as my memory serves) but well remember seeing my first one ever, proudly puffing out of Paddington in the late '40s. My luck however was better with the so-called Dukedogs. These were not officially known by this name; they were called Earls but it appeared that certain of the flesh and blood type Earls thought it undignified to have their names on "secondary" locomotives (as if any G.W.R. loco *could* be secondary!) and the names were transferred to Castles. Nameplates were transferred bodily. Hence there was no "Castle Class" addition to these plates as on other Castles not actually bearing the word "Castle" on the nameplate. The Dukedogs arose from the re-boilering of some Bulldogs when the latter were due for replacement/scrapping; it was found that although re-boilering was needed, many of the chassis were in good condition. Since some lighter but strong locos were needed for the Welsh lines (notably the Cambrian) the chassis had Duke-size boilers on them, hence the name Dukedog.

The prototype of this class was 3265, modified in 1930. This is an example of the numbering system "ringing the changes" for 3265 was *Tre Pol and Pen* as mentioned above, later renumbered as 9065 and still around at least in 1948. However, Holcroft (*An Outline of GW Locomotive Practice 1837-1947*) states that "a prototype had been tried out in 1930 and numbered 3265, bringing the total to thirty".

Fig. 2



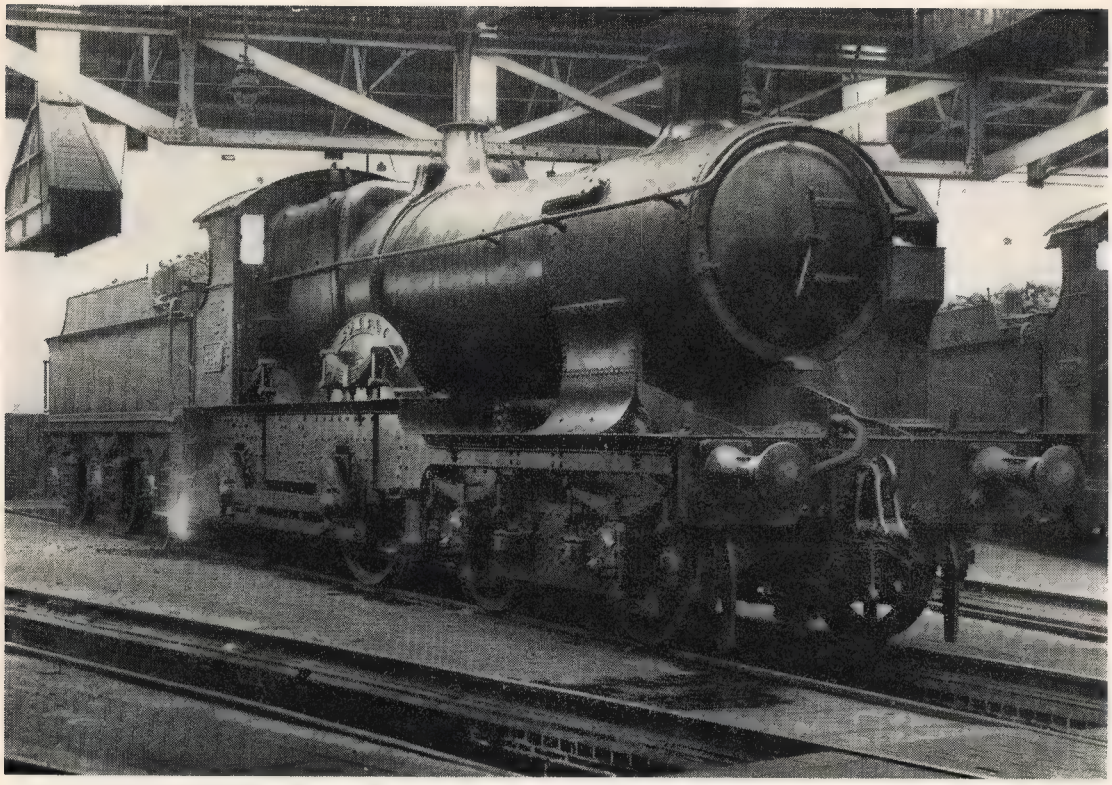


Fig. 3

I remember my first sight of these beauties in 1955 when I was en route to the Tal-y-Llyn railway; she was quietly simmering in Welshpool. Later that same day I was more than delighted to see one waiting in Machynlleth to take over my train; a few days after "my cup ranneth over" and I was to have a footplate trip for a few miles up the line from Towyn, although I was not invited to drive.

I do not know offhand the dates of the last Dukedog in service; there were only 27 by 1948 according to the ABC locospotter's book; but I am happy to note that one was preserved and now lives on the Bluebell line. By courtesy of the management I was permitted to wander round this loco and take some photographs; I have a mere 104 detailed shots both inside and out. I have also about 250 shots of the *City of Truro* (Swindon Museum) which had many similarities, so I should be able to get the details fairly correct. I have the Swindon GA of the Dukes, the Dukedogs, but have not got the GA of the Bulldogs. It is always possible that this was never drawn, for I remember a story about the Dean Singles to the effect that when it came to make a new batch, there were no drawings at all! This may have been "no drawings of the modifications") but fortunately it was discovered that the shops knew all the details and I suppose that the drawings were eventually made from the locos.

Some of these locomotives were changed from slide to piston valves. I do not know if all were changed but it would seem that most of the Dukedogs were; the Swindon G.A. shews piston valves, and obviously those in best condition would be likely to be selected for new boilers. These cylinders were almost unique, for they had outside admission piston valves instead of the more usual inside admission. I understand that this was because the eccentrics were fixed to the crank axle and could not be re-set. It was needful to have separate steam inlet pipes for each end of the cylinders; the "fork" in the pipe was in the smokebox with separate feeders to the cylinder block. The exhaust was midway between.

I have photographs of Dukes that were not distinguishable from Dukedogs, apart from the nameplates. It appears that some Dukes were built with the straight-topped frames as per later Bulldogs.

Some of the developments in the Bulldog classes are illustrated herewith. Fig. 1 is a "wavydog"; Fig. 3 is the later straight-topped frame. (Straightdog?) The last to be built were the "Bird" series (Fig. 2), and the names selected for these were most attractive. They were respectively *Blackbird,*

Bullfinch, Chaffinch, Cormorant, Flamingo, Goldfinch, Jackdaw, Kingfisher, Nightingale, Peacock, Pelican, Penguin, Seagull, Skylark, Starling; for Nos. 3441 to 3455. It would be indeed hard to find a prettier set of names, for such graceful engines.

In offering this as a design for builders, I have had to make many tricky decisions; I can only hope that some readers at least will be pleased. I have not named or numbered either loco, for there were so many variations between individuals that whatever I chose would be wrong somewhere. However, if enough readers are interested I am prepared to make out an accurate drawing of one or two nameplates and numberplates and no doubt someone will be able to arrange for photo-engravings.

All the Bulldogs of course had top feed at the sides of the safety valve (all G.W.R. taper boilers had this) but Dukedogs had both types (top and backhead, although not on the same loco). I will be shewing both, so take your choice. The outline drawings are pretty accurate and are to a scale of 10/113 full size. This is exactly right for 5 in. gauge. This may beseem an awkward figure, but with a slide rule there is no great problem. With the modern pocket calculator there is no problem at all; push the scale factor into a memory and then just recall it every time you need to multiply. Whatever scale is used, one has to round-off figures somewhere and I have worked generally to the nearest 1/32 in. except where 1/64 in. is needed in fine clearances. I am not planning at this stage to shew a Wavydog frame, for these had many differences from the straight frames; but I have the information available and if enough builders wish to make the Wavydog then no doubt something can be arranged. I would in any case appreciate a card telling me of who is building what so I can best cater for the majority.

The large numbers of rivets shewn are perhaps a bit daunting, but I strongly advise putting them in as it is one of the attentions to details that "make" a good loco as distinct from "another loco". I am planning for minor modifications for those who would like roller bearings; I will try to give simpler details as alternatives (as far as I can I will provide "scale" details where possible). If I can iron out the designs I will give slide valves and piston valves.

When I first worked on these notes I had not intended to build a loco myself, for I already have seven $7\frac{1}{4}$ in. locos on the go now. But I have changed my mind (I can resist anything, except temptation) and so you will have the benefit of photographs of the actual 5 in. loco under construction.

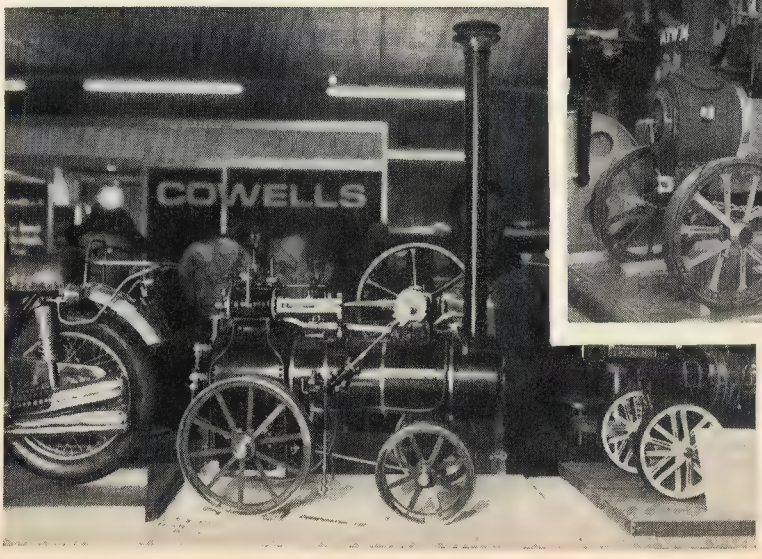
Happy Steaming.

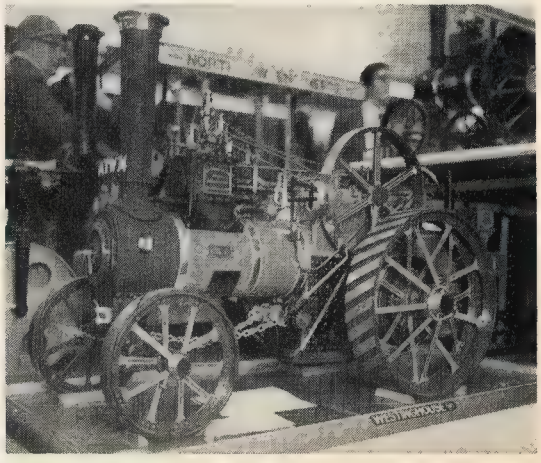
To be continued

At the time of going to press we understood that Messrs. A. J. Reeves of Birmingham will be supplying castings for this loco. The spelling of "shew" is deliberate, being the G.W.R. way, and left as such at the request of Mr. Wilson.—Ed.

CLASS 'L' REPORT

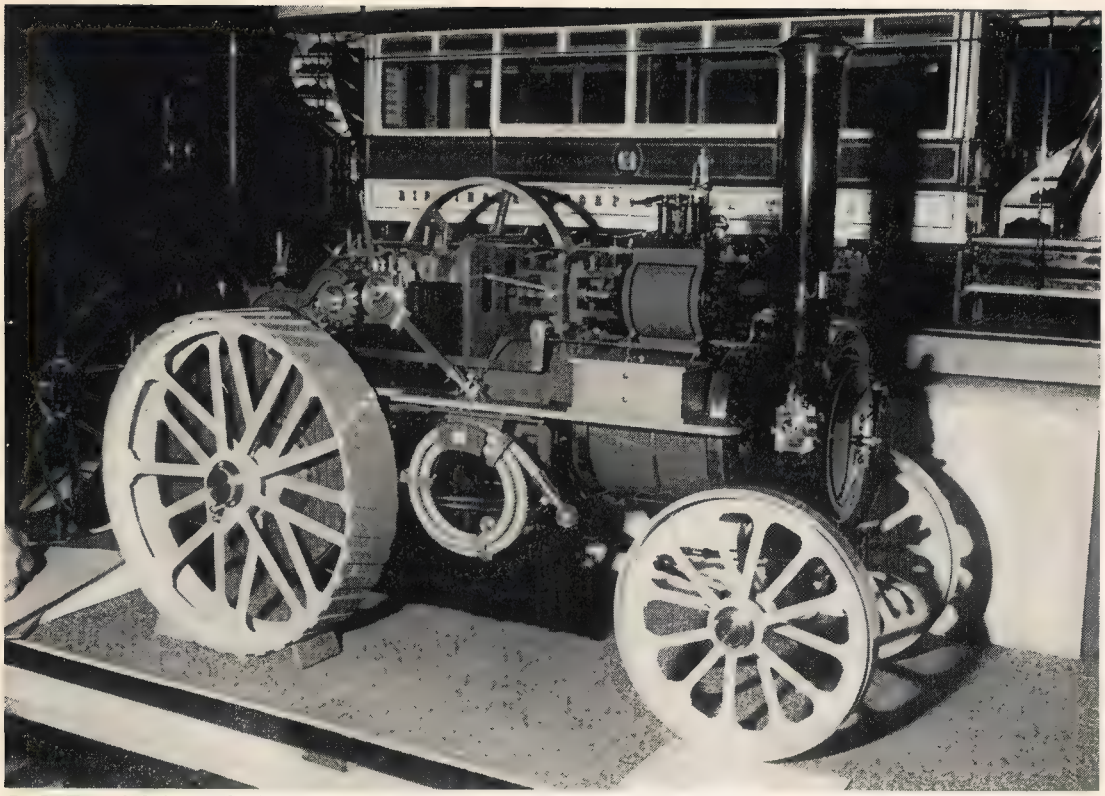
by John Haining





Above: Students' Cup winner—Burrell by Westinghouse Brake and Signal Co.

Left: Ron Kibbey's Marshall Portable Engine—Championship Cup winner.



L. J. Evans' 2 in. scale freelance traction engine—Aveling Barford Trophy winner.

EXHIBITS IN THIS CLASS ranged from road locomotives and traction engines to tramcars, with steam rollers represented by one 4½ in. scale "Simplicity" and a ½ in. scale freelance.

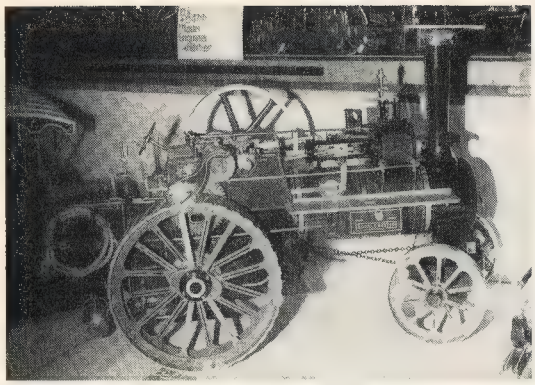
It would have been interesting if the steam exhibits could have been made even more representative by the inclusion of one or two 2 in. scale Fowler ploughing engines plus implements—there are now so many first-class examples about—and completed by another of the 2 in. scale Aveling and Porter rollers now finished but not yet publicly exhibited. Perhaps next year may see something of these engines at Wembley?

I was asked to accept three entries from Class J for judging with Class L entries, these being R. L. Kibbey's 1½ in. scale Marshall single-cylinder portable engine and E. F. Stratton's 2 in. scale Burrell road locomotive, together with a plastic construction kit engine which I could not accept as being a working steam engine. While not strictly speaking a mechanically propelled road vehicle, the portable steam engine is a direct ancestor of the traction and ploughing engine, many of the earliest self-moving engines being simply portable engines adapted by the addition of chain drive to self movement. Moreover, practically all firms building traction engines also built portable engines as part of their range of products and in view of this it was felt that inclusion of the portable engine for judging with Class L exhibits was justified. As most readers will know, the late W. J. Hughes commenced constructional articles on the 1½ in. scale Marshall portable in these pages, his engine being completed by R. L. Kibbey in time for the Exhibition.

This little engine is a delight to look at—exquisite is the word that comes most readily to my mind. The dull black paint finish is just right and personally I hope that no attempt is made to line it out as the contrast between bright metal and dull, even finish is most striking, recapturing memories of the Marshall stand at bygone agricultural shows. The Championship Cup awarded to the builder of this engine is well deserved and also a fitting tribute to the memory of Bill Hughes.

My only possible criticism is the use of bright brass for the nicely flared cap of the long stovepipe chimney—the engine is, after all, finished in working black.

The Aveling-Barford Trophy was awarded to L. J. Evans' 2 in. scale freelance agricultural traction engine, which, unlike some freelance entries was extremely well-proportioned and had that indefinable look of "tightness" about it. So often



Allchin "Royal Chester" by P. J. Marsden.

an attempt is made to include too many characteristic features of too many different makers in a freelance model and this engine was a first-class example of restraint in this respect. Workmanship was first-class, all locknuts and pins fitted where they should be, and such things as lamps, toolbox plus padlock *and key,* and correctly proportioned road gear teeth completed the picture. The chimney lacked rivets (it was obviously not an "Allen" cast-iron replacement) and wheels and strakes were painted, which was a pity.

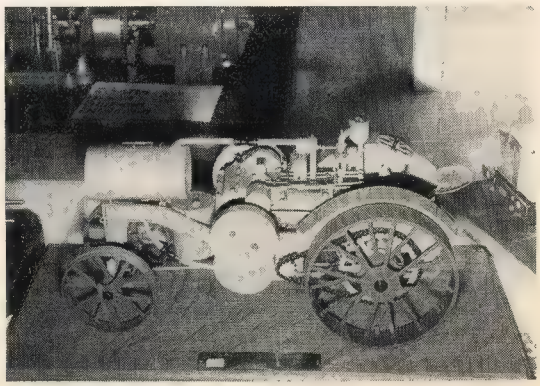
The big Burrell 3 in. scale engine of A. Robelow was another fine engine very difficult to fault and showing evidence of painstaking and careful work, the same being true of the 1½ in. scale Allchin, the "Minnie" traction engine and the showman's engines, one based on a "Minnie", the other the fine 2 in. scale Burrell "built by E. F. Stratton".

A nice Burrell "Devonshire" single crank traction in 1½ in. scale built by the apprentices of R. & H. Green and Solley Weir Ltd., was unfortunately rather spoilt by having bright, brass tyres on front and polished brass strakes on the rear wheels with a five-spoked flywheel of unusual form, but this engine was subsequently transferred to the student class.

The tramcars were all eye-catching, attractive models, each one different and equally fascinating to one who remembers travelling on them as a boy. The Birmingham Corporation and Liverpool Corporation Tramcars of R. H. Whetstone and I. J. Taylor respectively were superb models with outstanding standards of paintwork and detail; the two smaller tramcars did not quite reach the same high standard of painting and lettering but, nevertheless, were most attractive vehicles full of character. The generally high standard of workmanship and fidelity made the task of judging even more difficult and it was gratifying to note that with a few exceptions the correct materials had been used in the construction of individual parts of the engine entries.

Among minor faults noted were the difficult to avoid ones of rather irregular or faint linings to boiler barrels and wheel spokes with the latter not forming a correct angle soon enough after leaving the hind wheel hub. Wheels, front and hind, are better left unpainted and countersunk rivet heads should be visible in strakes and front tyres. A purely personal viewpoint is that the appearance of an engine, at least up to 3 in. scale, can be much improved by making the hind wheel width slightly *over* scale, tee rings and spokes, etc. being left strictly to correct scale. The awnings of several engines were a little uneven, this in one or two cases being due to the awning having a detachable length for access to the controls when driving, always difficult to hide.

All in all, a remarkably fine collection of models which were a credit to the skill and enthusiasm of their builders and an inspiration to others—including the writer—to emulate the high standards attained in this class.



Above: Class O V.H.C., a I. H. Titan Tractor by P. A. W. Fulkner.

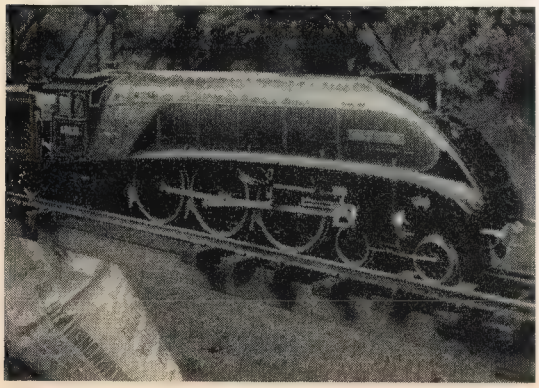
Left: The Tramway & Light Railway Society exhibits in the foyer.

Club Chat... with the Editor

"Britannia" fans will be interested to know that on the 14 or 21 May the re-naming ceremony will take place and on 7 October the loco is booked to run on part of the Newport-Shrewsbury line. Seven years of hard work have thus reached their just conclusion and doubtless there will be many model engineers and other steam enthusiasts very grateful for the efforts of a comparatively few people. The **Britannia Locomotive Society** informs us that the Department of the Environment has laid down a set of strict rules regarding inspection and maintenance of boilers. Lifting and re-tubing may become more frequent. Members of this Society can now purchase brass nameplates made from the originals for a cost of £66 each. The *70000 Journal* also tells us that the Severn Valley Railway has received loco 45000, the original Crewe "Black 5", which should be in steam soon. Keighley and Worth Valley Railway has also received another loco. This one is an American built austerity 2-8-0 number TR 203 474.

Colchester and Chelmsford clubs, and no doubt many other readers throughout the country, will mourn the passing of James Banyard on 23 December at the age of 86. He will be remembered for his membership of the S.M.E.E. and stewardship at the M.E. Exhibition for 20 years. Mr. Banyard was an apprentice at the Great Eastern Stratford workshops some 70 years ago and spent the remainder of his working life involved with engineering and maintenance. His free-lance "Princess Amelia" based on the Tilbury Tanks won him an award at the 1961 Exhibition and the model is now at the Passmore Edwards Museum.

Anyone with a few spare hours will, I am sure, be most welcome to spend them down at the **Exeter and District M.E.E.S.** where the club has been granted, not only permission by the Exeter Council to rebuild its track from a raised multi to a ground level multi and include a 7¼ in. gauge as well, but also an unspecified amount of money from the same source to assist in the purchase of steel. The new track will be about 650 ft. long with a minimum radius of 45 ft. The secretary will be pleased to hear from volunteers and will also offer information to any other club desirous of performing the same feat. His name is Mr. J. E. G. Shell and his telephone number, 0392 77795. Mr. Shell has also offered *M.E.* an illustrated article on the progress of the track which we hope to publish later.



The new secretary for **Vancouver Island Model Engineers** is Maurice W. Foord who lives at 3670 Craigmillar Avenue, Victoria, B.C., Canada V8P 3H3. He tells us that the club is growing well and membership stands at 50 with the majority actively engaged in the construction of locos to various scales. There are some, however, with marine and stationary engine preferences so the club could put on a pretty good show. Running is on a privately owned track (3½/7½ in.) at present but the club is now building its own raised track of 3½/5 in. gauge to be opened, hopefully, in May. Mr. Foord tells us that they have no climate problems out there. No comment.

Taking a trip across the Pacific we find that **The Steam Locomotive Society of Victoria** also had no weather problems for its Country Week-end last year when over 150 members and visitors spent a happy couple of days "playing trains", with plenty of good things to eat, and film shows for the kids. And some of those who left for home on the Sunday night had a 190-mile drive ahead. That's enthusiasm.

We don't hear much about the **7¼ in. Gauge Society** in these pages because, as the Editor of their journal, Dr. J. B. Rogers, tells us, most of the events are intended for members and families only and full details are circulated to these through the magazine. However, I, personally, was approached by one gentleman at the M.E. Exhibition and asked if such a Society existed, so I am sure that many other readers will be interested in joining. Although it has been in existence only three years, the membership now stands at 250, which is excellent progress. Nor is this confined to the U.K. as many members come from world-wide. So, if the **7¼ in. Gauge Society** sounds as if it is for you, then write to the secretary, Mr. D. Walters, at 16 Station Road, Kenilworth, Worcs., or telephone him on Kenilworth 53244.

At Viables Activities Centre, Basingstoke, there is also a lot of track laying going on and about one-third is currently completed. The club, **Basingstoke & District M.E.S.,** has eased off to await the Spring and renewed energy. But from the photo shown here the work is going very well.

This Laurie Lawrence shot of Ben Dunster's "Wild Swan" is a reminder that the 1978 I.M.L.E.C. is not far off. But please wait for further details.

Post Bag

The Editor welcomes letters for these columns. Pictures, especially of models, are also welcomed. Letters may be condensed or edited.

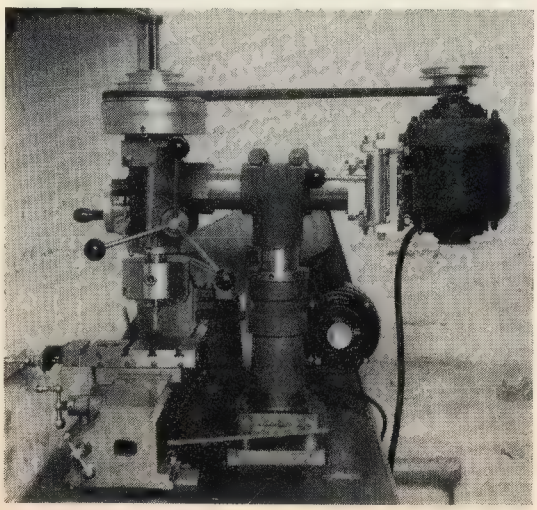
Dividing and Screw-cutting

SIR,—My attention has been drawn to a remark made on p. 1423 (16.12.77) to the effect that the Radford dividing head was not applicable to the ML7 lathe "owing to the 65T bull-wheel". This was a slip; I should have said that, owing to the fixing method adopted, it could not be fitted to the ML7 in its published form and further, that the 65T bull-wheel compared very unfavourably with a 40T or, better, a 60T worm-wheel although a lot of dividing can be done by its use as I have explained in an article on worm and wheel dividing which I have prepared.

Another matter has been brought to my attention by Martin Cleeve who, with considerable perspicacity, said that he doubted whether there would be room on the metric quadrant for use with the QC box (which he does not possess) to set up the gear train $\frac{21}{50} \times \frac{45}{100} \times \frac{55}{50}$, see my letter p. 1368 (2.12.77). He was perfectly correct in his surmise but, by rearranging the order of the wheels it is possible to set them up as follows: $\frac{55}{50} \times \frac{45}{50} \times \frac{21}{100}$. This train satisfies the rule (my own rule) that the sum of all the teeth in the second and third pairs of gears must not exceed 220 and the sum of the teeth in the first pair must not exceed 130.

This train could be improved upon by setting the gear-box to cut 40 t.p.i., the effect of which is to eliminate the second 50T and the 100T leaving standard gears as follows: $\frac{45}{50} \times \frac{55}{25} \times \frac{21}{40}$. This shows how the QC box can be used to reduce the total number of teeth in trains.

New Milton, Hants. Geo. H. Thomas



Boiler Steam Outlet Pipe

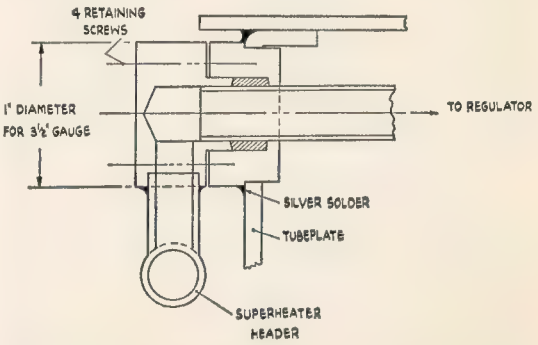
SIR,—Prompted by Mr. Holmes' letter and sketch in *M.E.* issue 3571, I enclose a sketch of a gland-type fitting for the boiler steam outlet pipe arrangement which I have used on all my locomotives with the exception of one and think the system may be of interest to other loco builders.

On the exception mentioned I did try the scheme of similar pitch threads which always seem to be put forward in M.E. designs, but soon realised its shortcoming; it *can* be assembled if the regulator block is positioned after the steam pipe is tried in position to allow coincidence of the threads. There does, of course, remain the difficulty of ensuring a steam-tight joint on the running thread on the steam pipe at the front end.

My arrangement is perhaps less complex than that of Mr. Holmes and obviates the need for precision turning to ensure correct fitting of "O" rings and this might appeal to some builders.

It may be argued that Mr. Holmes' or my system gives no support to the tube plate which the screwed arrangement can do if done correctly, but I would say that as the fitting is so close to the tube plate/barrel joint that no support is necessary at this point and therefore, nothing is lost.

Whitley Bay, Tyne & Wear NE25 9DZ. Max Lewitt



Combining the Dore Westbury Vert-Miller/ML10

SIR,—I am very much an amateur at model engineering but on graduating from a Unimat to an ML10, I missed the ability to vertically mill and drill using the lathe as a compound table.

Some readers may be interested in the compromise solution I have arrived at within my cash and space limitations, by building the top part of the Dore/Westbury Vertical Mill and mounting it behind the lathe. As can be seen from the enclosed photograph, the miller is firmly bolted to T angle welded across a very strong angle iron bench. It is intended that the steel plate under the base of the miller should be bolted to the lathe bed for rigidity.

To date I have not completed my original plans for mounting the miller, but even so it does appear to be free from vibration and shake in operation and an economical idea which could be used with most lathes.

There is no reason why at a later date the miller should not be completed with its own much larger compound table when sufficient funds become available. The only difficulty I foresee in bolting the stiffening plate to the lathe is in ensuring that no undue distortion is applied to the lathe bed.

C. L. K. Ledger

Albrighton, Nr. Wolverhampton WV7 3NH.

Bench Grinder

SIR,—Mr. A. Goddard (*M.E.* No. 3574, p. 1369) raises certain interesting points, both with regard to model engineering as a hobby, and with regard to my "restored" bench grinder in particular. I would like to point out first of all that the late K. N. Harris said of the model engineer, "If anyone has sufficient intelligence to pursue model engineering as a hobby, it is a fair assumption to credit him with well developed reasoning powers and the capacity to exercise them . . . ". I agree with this, and assumed, and still assume, an intelligent *M.E.* readership. Mr. Goddard, however, implies that model engineers are such idiots that they should slavishly follow "recommended practices" even though such practices were developed for situations far removed from those which apply in home workshops. I wonder if Mr. Goddard has considered the possibility that the regulations to which he refers were drawn up assuming no intelligence, interest in the job, etc. as well as assuming that industrial machinery is used for one class of work. Amateur machinery, on the other hand, has to perform over a wide spectrum, and the grinder is no exception.

My instinct of self-preservation is as strong as anyone else's, and if we must have a code of practice, well and good, but let it be drawn up for model engineers, Mr. Goddard, not botched up from a code which was never intended to cover our class of work.

Now may I deal with Mr. Goddard's specific objections to my bench grinder?

1. Wheel exposure. I am not sure exactly what is meant by this. However, I assume that the objection is to the fact that a lot of wheel periphery is exposed. I have, in fact, seen at least one large professional machine with this much exposure although there were perspex shields independent from the guards. Rightly or wrongly I dislike these since they quickly become so badly scratched that they obscure the job. I did state in the article that given care I considered them adequate.
2. Hub washers too thin. The hub washers are $\frac{1}{8}$ in. thick, recessed by 1/64 in. E. T. Westbury, in his original article on the ME bench grinder, recommended a minimum of .010 in. I see no reason to doubt his competence. Further the B&D D.385 5 in. bench grinder sold over the counter *for home workshop use* has 3/32 in. sideplates which are recessed by stamping. Even the recessed portion of my side plates are at least this thickness and annular clamping *is* achieved.
3. Grinding on the side of a straight (or parallel) wheel. Quite so, Mr. Goddard, that wheel is coned at the back and flat on the front. I reckon this gives me enough strength to *finish grind* in the manner illustrated by the set-up. Incidentally, the cone shape *does* show in the photograph.
4. Both tool-rests can be easily adjusted to *touch* the wheels if necessary. Even a cursory glance at the illustrations would have shown that. The fact that they were not so shown was for clarity only. I do not mind my workmanship being called into doubt, Mr. Goddard, but to suggest that I am fool enough to use grinding rests so far down the wheel I find insulting in the extreme.
5. The left-hand wheel in need of dressing. This was indeed so. In fact, I had considered leaving it off for the photograph session since I had no intention of using it. In retrospect I should possibly have done so. In fact that wheel was oval and has been thrown away and a new one obtained. My apologies if it misled anyone.

I gain great consolation from the fact that Prof. Chaddock has been sentenced to the doghouse in the same letter. If I could serve my sentence with him I am sure that I should have learned much by the time Mr. Goddard lets us out.

Finally I look forward to an article by Mr. Goddard on the use of abrasive wheels *in the home workshop* and apologise to our Editor for such a long letter. I do not consider that *M.E.* itself has any case to answer.

Loughborough, Leics. M. J. Rooth

Turning the Wood—in Safety

SIR,—A nice little article, somewhat out of place but refreshing, like a daffodil in a well-tended vegetable patch.

No criticism of the contents until we learn that it is Mr. Rayer's practice to drape cloth over his lathe slides to catch the wood chips.

Mr. Rayer, and anyone else, reading this advice; Never, Never, Never approach within a yard (sorry, a metre) of any moving machinery with a piece of cloth or cotton waste. It surely does not need spelling out.

One further piece of advice, the slower the movement of a machine, the greater the power, the greater the danger. Don't forget, it will never let you go, and again, if you are a gentlemanly model maker, make sure you wear a secure tie clip.

Cover your slides, Mr. Rayer, but with paper: readily tearable paper; and in sanding, use a length of sandpaper less than the circumference of your workpiece unless, famous last words, you know which way to wrap it around.

Keep your sleeves rolled up!

Hanham Green, Bristol BS5 3NG. Arnold Cooke

Steam Crane

SIR,—I have written in connection with "Tubal Cain's" description of a toy steam crane in *M.E.* Vol. 143 No. 3574 and Vol. 143 No. 3575. I have enclosed a photo of an LBSC crane built by my father nine years ago. It has always run well. I hope this photo will inspire many people to build the crane described by "Tubal Cain" as mine has given me many hours of pleasure.

Thatcham, Berks. D. J. Cooper

Boxford Lathes

SIR,—I also have seen the letters recently printed relating to Boxford Lathes—I too took delivery a few years ago of a A.U.D. model in perfect condition from someone who died and unlike Mr. Chesher who is in business I am a pure amateur, but on using the lathe it is nothing but stop start, stop start all the time. How I would like to see the firm put a clutch on the market. Sometimes I have thought to myself that a lot of manufacturers simply leave out items of importance to keep the price down.

Can we hope to have assurances from the Boxford firm of a clutch attachment in the near future, or are we expecting too much?

Regents Park, Southampton. Robert Miller

Boxford replies

Our AUD lathe is designed and marketed primarily for schools and colleges and the demand for a clutch has been virtually non-existent.

Further, these machines are normally supplied with three-phase electrics which are much more resilient to regular stopping and starting than single.

However, since the successful launch of our ME10 machine some 12 months ago the requests to supply a clutch have been considerable and as is now generally known, this is available as an optional extra but only for the ME10 model.

It may prove possible at some future date to adapt this for other machines but at the time of writing we have no firm plans to offer this.

Wheatley, Halifax. Boxford Machine Tools

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SIR,—I have been filing nearly every day for the past 45 years. This little dodge was handed down to me from my father who used to make his own files with a hammer and chisel in those days.

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Take it from me it works, I have never met an engineer with this tip.

After cleaning a few files, at the ends of the scrap metal you will find teeth have formed; these can be filed off and start again.

Ringwood, Hants. E. P. Turpin

2½ in. Rally

SIR,—Reference Laurie's article on the 2½ in. gauge rally at Colchester and to give credit where due, the "Ada" illustrated was built by Bernard Escrit of Yeovil. The loco referred to as a "Jinty" posed under the nameboard is LBSC's version of a Gresley J.39 0-6-0 built by himself. I am just the fortunate owner of these engines.

Staines, Middx. G. Williams

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Post Bag—*continued from page 230.*

Horse-drawn Vehicles

SIR,—I note that Mr. Anthony Beaumont, in *M.E.* for 18-30 November, calls me to task for my article in an earlier issue, and implies that *all* wheels fitted to horse-drawn vehicles were dished, also that their spokes were always staggered. This I refute most strongly. I have been professionally connected with many types of such vehicles for upwards of forty years, and still am today, therefore, I have ample practical experience to draw upon.

I freely agree that there were very many wheels built with "dish", and this applies to wheels of all types, with even hand-barrow wheels included. I am certainly not going to enter into the age-old arguments for and against dishing; but I will go so far as to say that dishing is, most certainly, by no means the be-all and end-all in wheel-making!

Regarding the staggering of spokes, in my extensive experience, the great majority of the wheels I have come across, both in the past and today, have had their spokes set in the same plane, otherwise, *not* staggered. The actual practice of "staggering" the spokes into the nave, or stock, appears to have been introduced roughly in the middle of the 19th century, and while it is principally found in the heavier types of wheel, it is also found, to a lesser degree, in lighter types, even in some of the bigger carriage wheels.

As to the shaping of the inner surface of the felloes of wheels, this point *is* an important one for model-makers to follow in their models, it will most certainly make the wheels look truly authentic!

Despite what Mr. Beaumont advocates, there were very many heavy wheels without dish, likewise very many without staggered spokes, even including farm vehicles. All those with "Artillery-type" naves to the wheels, of course, are an outstanding case in that latter point, heavy and light types of wheels. Another point is that, in model wheels, the joints between felloes need not be showing, although this is less important in heavy wheels, such as those of farm vehicles; a good wheelwright made sure that the joints were as little visible as possible, and the coachpainter followed on, with the end result being a wheel where it was next to impossible to detect any joints!

The "classic" book, when it comes to details of the building of farm vehicles, is of course Sturt's *The Wheelwright's Shop*, a book which I first saw many years ago, and naturally, still have. Another more recent issue is *The English Farm Wagon*, by J. Geraint Jenkins, published by the University of Reading, 1961. Sadly, and also oddly, there are, at least as yet, no similar books dealing with the building of the many types of lighter vehicles, such as tradesman's and commercial types. I must admit that I have known of several recent cases of collapsed wheels, and, to confound the "dishing" brigade, more than one such casualty had been to a *dished wheel*, only one to a "flat" one!

The wheelwright's craft is making a great comeback of late, owing to the tremendous revival of interest in driving, which extends world-wide. Also, several commercial firms have reverted to draught-horses in recent years, and numbers of horses on the farms and smallholdings have recently been stated as more than thirteen thousand! Such a number is a vast increase on those of only a few years back, again showing increased interest in the good old draught-horse. Similarly, the craft of modelling horse-drawn vehicles also increases apace, and, as well as the good old hardy annuals such as farm wagons, carriages, and the gypsy living-wagons, there are a good number of tradesman's and commercial vehicles amongst the models of these days.

My own preference is for the commercial types, and last spring I completed a large model of a London coal-trolley; there is the horse and harness now to make, to finally finish the turnout. I have recently begun another three models, which are a milk-float, a greengrocer's van, and a heavy, pair-horse, covered railway wagon. All are models of actual vehicles, two of which I remember personally. They are exactly to scale, of course, with the finest possible detail included. The railway wagon has undished wheels, with no staggering of spokes, quite authentically, too! Both the others have dish to their wheels, the greengrocer's van has also staggered spokes. All will be finished off with suitable loads, such as the coal-trolley, which has perfect little coal-bags with real coal in them, also a set of scales and weights. Even the contemporary prices of coal, *circa* 1936, are chalked up on the price-tablets on the trolley's top name-board. (For those intrigued as to what they were, in 1936, there was house-coal at 2s. 4d., and nuts at 2s. 7d., both per hundredweight!) There is also a nosebag for the horse, hanging beneath the trolley; it is filled with "chop", which I compounded from a mixture of outdated lawn-grass seed and sawdust; it does look "spot on", too! I hope in the future to write and illustrate an article dealing with some of my models, at least, when I get time to photograph them.

Meanwhile, on this island, there are some forty vehicles, from carriages to a few farm vehicles, which keep my interest going, and help to keep me busy both in the summer as well as winter. I have a Victoria carriage standing in my workshop, which I have to repair and redecorate; there is another big vehicle which I have to "line out" this winter, as well as a few more which need small repairs, etc.

Sark, Guernsey. Bernard B. Murdock

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Union Nuts	8p	9p	9p	9p	16p	
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Plain	33p	34p	34p	41p	45p	
Female	34p	36p	36p	43p	51p	
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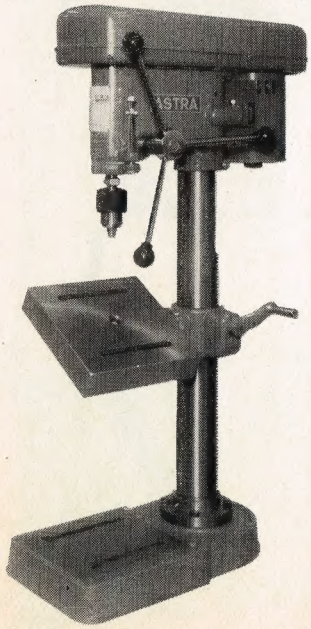

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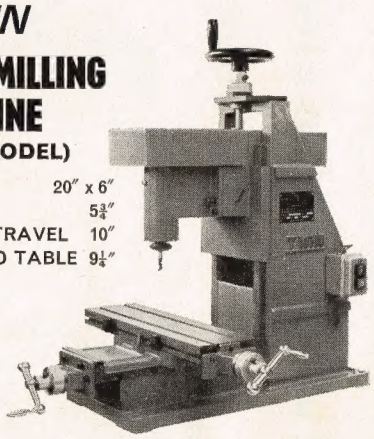

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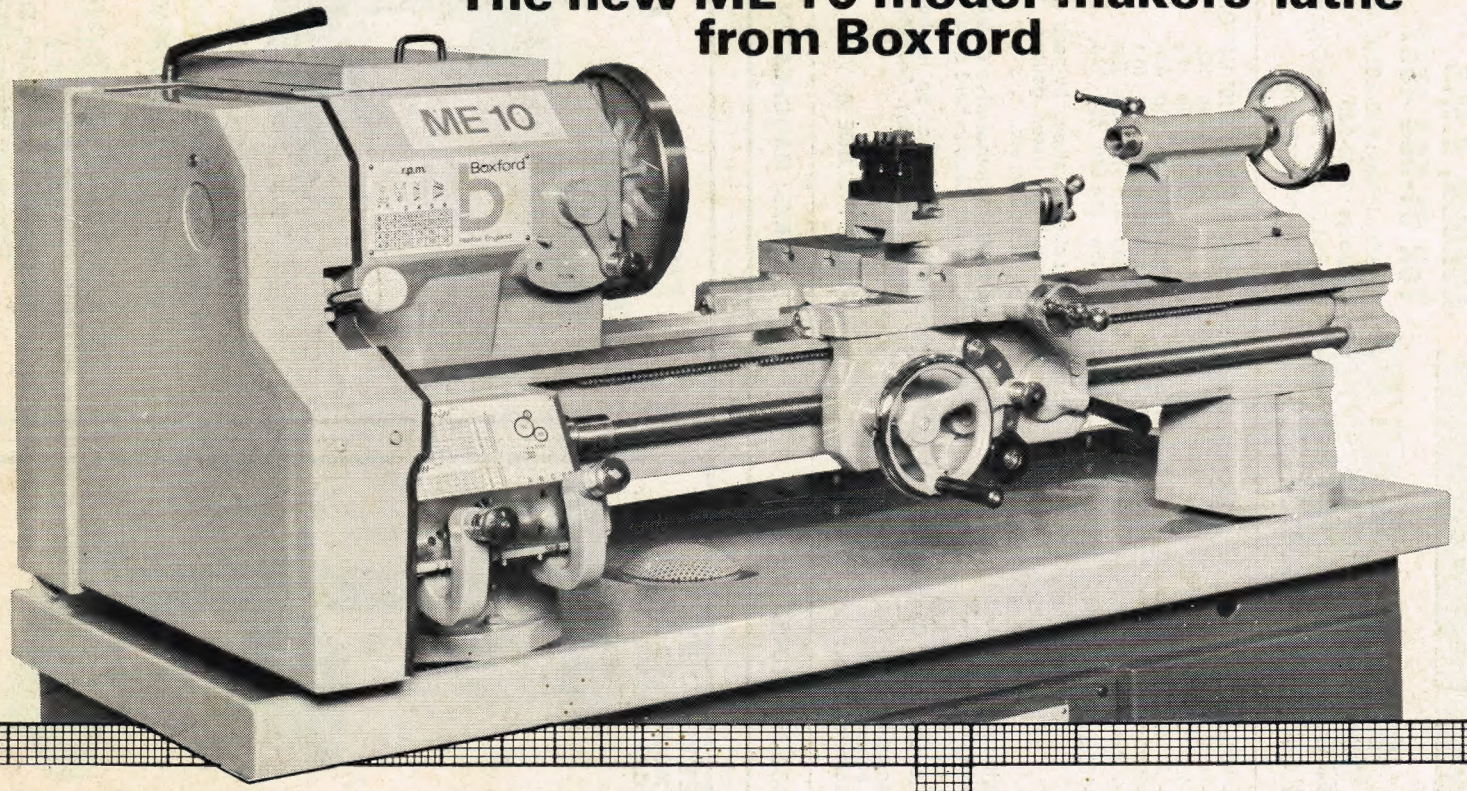

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